THE DEVELOPMENT OF A FRAMEWORK TO ACHIEVE ALIGNMENT BETWEEN INFORMATION TECHNOLOGY (IT) AND BUSINESS OBJECTIVES WHILE ADHERING TO IT GOVERNANCE PRINCIPLES

by
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Declaration

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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ABSTRACT

Information technology (IT) is developing at an accelerated rate, making it virtually impossible to separate business and IT strategy. The rate, scope and impact of recent technological advances has led to the fourth industrial revolution which is characterised by the exponential rate of technological developments, its global impact on most industries, and its significant influence on how companies are doing business today. In order to gain and maintain a competitive advantage, companies are forced to stay abreast with new information technology and its impact on not only their own companies, but also their competitors and the industry in which they operate.

Due to pervasive implementation, IT can no longer be viewed in isolation. The IT strategy of a company has to be integrated with its overall business strategy in order for IT to add value to a company. It is important that both senior management and IT specialists be engaged in the design, implementation and revision of IT solutions in order for IT to assist in meeting strategic objectives while maintaining a competitive advantage. Miscommunication between business and IT managers is a major contributing factor to IT projects failing to deliver the desired value. This concept is known as the IT gap. Many companies currently follow an unstructured approach towards the implementation of IT solutions due to the IT gap.

The purpose of this study is to develop a tool that can be used by companies to bridge the IT gap by aligning business and IT objectives. The author proposes the development of a framework which can be used by companies to achieve alignment between their IT and business objectives while adhering to IT governance principles.

A hypothesis exists that alignment between IT and business objectives can be achieved by defining the key driving forces of a company, known as business imperatives, and designing the IT architecture with the objective of supporting these business imperatives. By validating a list of business imperatives commonly found in companies, the findings of this research validates the aforementioned hypothesis and concludes that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap. This has resulted in a framework which provides practical guidance to senior managers of a company to both identify the business imperatives relevant to the company, and assist IT specialists when designing and implementing IT architecture to support these business imperatives. The framework consists of three elements, representing the process necessary for the

achievement of strategic alignment between business and IT. Firstly, a list of validated business imperatives are provided, which can be used by senior managers to identify the key driving forces relevant to the company. Secondly, the framework contains the business requirements needed to give effect to these business imperatives and lastly, the potential impact of these business requirements on the IT architecture of a company is discussed.

This framework can be used to improve communication between senior managers of the business and IT specialists. This improved communication will ensure alignment between strategic objectives and IT strategy, resulting in the elimination of the IT gap.

UITTREKSEL

Inligtingstegnologie (IT) ontwikkel teen 'n versnelde tempo en dit raak bykans onmoontlik om besigheids- en IT strategieë van mekaar te skei. Die pas, omvang en impak van onlangse tegnologiese ontwikkelings het tot die vierde industriële revolusie gelei. Hierdie revolusie word gekenmerk deur die eksponensiële tempo waarteen tegnologie ontwikkel, die internasionale impak van hierdie ontwikkelings op bykans alle industrieë en die omvangryke invloed daarvan op die wyse waarop maatskappye besigheid doen. Maatskappye word genoodsaak om op hoogte te bly van nuwe inligtingstegnologie en die impak daarvan op hul eie maatskappy, hul mededingers en die industrie waarin die maatskappy werksaam is, om sodoende 'n mededingende voordeel te handhaaf.

As gevolg van die omvattende implementering van IT in maatskappye kan dit nie in isolasie beskou word nie. Die IT strategie van 'n maatskappy moet met die maatskappy se oorhoofse besigheidstrategie geïntegreer word alvorens IT waarde tot die maatskappy sal toevoeg. Dit is belangrik dat beide senior bestuur van 'n maatskappy en IT spesialiste by die ontwerp, implementering en hersiening van IT-oplossings betrokke moet wees ten einde die bereiking van strategiese doelwitte te ondersteun en 'n mededingende voordeel te behou. Miskommunikasie tussen besigheids- en IT bestuurders is 'n groot rede waarom IT projekte nie die verlangde waarde toevoeg nie. Hierdie verskynsel staan as die IT gaping bekend. Baie maatskappye volg tans weens die IT gaping 'n ongestruktureerde benadering tot die implementering van IT-oplossings.

Hierdie studie het ten doel om 'n hulpmiddel te ontwikkel wat deur maatskappye gebruik kan word om die IT gaping te oorbrug deur die belyning van besigheidsdoelwitte met IT doelwitte te verseker. Die skrywer is van voorneme om 'n raamwerk te ontwikkel wat deur maatskappye gebruik kan word om belyning tussen hul besigheids- en IT doelwitte te verseker en terselfdertyd aan IT beheer beginsels te voldoen.

Daar bestaan 'n hipotese dat die belyning tussen IT- en besigheidsdoelwitte bereik kan word deur die sleutel dryfkragte, genaamd besigheidsimperatiewe, van 'n maatskappy te definieer en die IT argitektuur van 'n maatskappy sodanig te ontwerp dat dit die relevante besigheidsimperatiewe ondersteun. Die bevindinge van hierdie navorsing bevestig hierdie hipotese deur 'n lys besigheidsimperatiewe, wat dikwels in maatskappye voorkom, te bevestig en kom tot die gevolgtrekking dat besigheidsimperatiewe wel as die dryfkragte van 'n maatskappy dien en gebruik behoort te word as die basis om die IT gaping te elimineer. Dit het gelei tot die ontwikkeling van 'n raamwerk wat praktiese leiding aan senior bestuur van 'n

maatskappy rakende die identifikasie van besigheidsimperatiewe relevant tot die betrokke maatskappy verskaf, asook bystand aan IT spesialiste verleen om IT argitektuur, wat die besigheidsimperatiewe van 'n maatskappy ondersteun, te ontwerp en te implementeer. Die raamwerk bestaan uit drie elemente wat verteenwoordigend is van die proses wat gevolg behoort te word om strategiese belyning tussen besigheid en IT te bewerkstellig. In die eerste plek word 'n lys bevestigde besigheidsimperatiewe verskaf, wat deur senior bestuur gebruik kan word om die sleutel dryfkragte relevant tot die maatskappy te identifiseer. In die tweede plek bevat die raamwerk, die besigheidsvereistes wat benodig word om uitvoering te gee aan die besigheidsimperatiewe en laastens word die moontlike impak van hierdie besigheidsvereistes op die IT argitektuur van 'n maatskappy beskryf.

Hierdie raamwerk kan gebruik word om kommunikasie tussen die senior bestuurders en IT spesialiste van 'n maatskappy te verbeter. Meer doeltreffende kommunikasie sal die belyning tussen die strategiese doelwitte en die IT strategie van 'n maatskappy verseker, wat tot die eliminasie van die IT gaping sal lei.

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CHAPTER 1: INTRODUCTION AND RESEARCH OBJECTIVE

1.1 Introduction and background

Recent studies conducted by Briggs, Foutty and Hodgetts (2016:2-3) show that the rate at which information technology (IT) is developing is faster than ever before and that IT developments are influencing every part of a company in a significant way (Pande & Schrey, 2016). IT is incorporated into all aspects of the company and it is becoming virtually impossible to separate business and IT strategies. This symbiosis is leading to new technologies and trends and is having a major impact on many facets of companies. These aspects include interaction with customers, the way in which day-to-day tasks are conducted and the markets and industries in which they operate (Briggs, 2015:2). This trend of rapid development in IT is illustrated clearly by the hype cycles generated by Gartner (n.d.), a research and advisory firm which specialises in technology research. The hype cycles represent the maturity, adoption, application and relevance of specific technologies and applications for solving business problems and exploiting new opportunities, thereby adding value to companies (Gartner, n.d.).

The impact of the development in IT is so profound that it is referred to as the fourth industrial revolution (Schwab, 2016). According to Schwab (2016) there are three reasons for the recent developments in IT being classified as the fourth industrial revolution rather than a mere continuation of the third industrial revolution. In the first place the rate at which IT is developing is exponential compared to a linear rate of development associated with the previous industrial revolutions. Secondly, the scope of disruption is unprecedented since nearly all industries are impacted globally. Lastly, entire production systems, management and governance are influenced by the development in IT. The impact of developing information technologies far exceed the impact of the technological developments in the third industrial revolution.

Technological change has given rise to new ways in which companies can create, deliver and capture value to customers in order to generate revenue, in other words new business models (Osterwalder, 2004:15, 18-19; Osterwalder & Pigneur, 2005:13). As a result of the impact evolving technologies have on a company's business model, as well as the business models of its competitors, it is important for companies to stay up to date with new information technologies and trends. The adoption of new IT developments may be beneficial to particular companies while at the same time, failing to implement new information technologies or trends, may have devastating consequences for a company. As the fourth industrial revolution is still

in its infancy the consequences of not implementing IT solutions to support the business objectives of a company could become even more detrimental to the success of companies in the near future (Bey, 2016). However, staying up to date with new information technologies and trends will enable senior management to assess the impact thereof on the company, as well as the industry within which it operates. This assessment needs to be utilised in order for a company to avoid losing market share or its competitive advantage (Osterwalder, 2004:13).

The rapid growth of IT and its pervasive implementation in all areas of business necessitate the need for the governance thereof. As business leaders are forced to focus on the value that IT can deliver to their companies, they are also confronted with the challenges associated with the risks introduced by the implementation and use of new IT solutions (Hardy, 2006:59). A balance need to be found between exploiting the advantages presented by new IT developments and minimising the associated risks introduced into the company. The King Report on Corporate Governance for South Africa (King III) explains the inclusion of IT governance as a subset principle of Corporate Governance in its third edition as follows: “Information systems were used as enablers to business, but have now become pervasive in the sense that they are built into the strategy of the business. The pervasiveness of IT in business today mandates the governance of IT as a corporate imperative. In most companies, IT has become an integral part of the business and is fundamental to support, sustain and grow the business. Not only is IT an operational enabler for a company, it is an important strategic asset to create opportunities and to gain competitive advantage. Companies have made, and continue to make a significant investment in IT” (Institute of Directors Southern Africa, 2009:16).

In the section relating to IT governance, King III requires, amongst other things, companies’ IT strategies to be integrated with their overall business strategy and business processes (IT governance principle 5.2) and that IT should add value to the company by aiding the enhancement of a company‘s performance (IT governance principle 5.4) (Institute of Directors Southern Africa, 2009:83). Bowen, Cheung and Rohde (2007:191) argue that both senior management of the business and IT specialists should be engaged in the design, implementation and revision of IT solutions in order for IT to assist the company in meeting its strategic objectives. Alignment between the business side of a company (consisting of senior management responsible for designing and implementing the business objectives and implementing the structures, processes and mechanisms to address IT governance (Institute of Directors Southern Africa, 2009:83)) and IT specialists (senior management of the IT department of the company responsible for implementing IT solutions and control techniques

on a component level, in order to achieve IT governance objectives) is therefore critical to achieve strategic alignment and consequently deliver value as required by King III (Goosen, 2012:14-15; Rudman, 2011:37). A survey conducted by McKinsey&Company (2016) supports this statement by indicating that companies whose IT departments are actively involved in the overall business strategy of the company, perform its core services far better than companies whose IT departments function in isolation (Khan, Reynolds & Schrey, 2016).

Despite the emphasis King III places on the importance of alignment between the IT department and business, miscommunication between business- and IT specialists often take place. Both Rudman (2011:37) and Osterwalder (2004:16) argue that a gap exists between these two parties, largely as a result of IT specialists not understanding the business objectives, the need for IT governance, together with control frameworks and models, and senior management's lack of understanding of IT and control techniques. The findings of a survey conducted by McKinsey&Company (2016) supports the findings that misalignment between business and IT is a common occurrence as very few respondents indicated that IT is currently collaborating with business and supporting business in its overall strategy (Khan *et al.*, 2016). The vast majority of respondents of their survey however agree that IT should play a partner role in the business. Furthermore the findings, for the fourth successive survey, indicate a major gap between the way in which senior management and the IT function view the top priorities of the IT function (Khan *et al.*, 2016). For the purpose of this study, this will be referred to as the "IT gap" or "misalignment between business and IT". As a result of the IT gap, companies currently follow an unstructured and ungoverned approach towards the implementation of IT solutions.

1.2 Research problem

Rapidly evolving IT can have major benefits for companies but also introduces significant risks. It is vital for companies to implement IT solutions which are aligned with their strategic objectives in order to maximise benefits and add value to the company, while at the same time governing risks related to the IT solutions implemented.

In order to ultimately achieve alignment between business and IT within a company and close the IT gap, as required by King III, Boshoff (2014) argues that the business context of a company should drive its IT control environment. For a company to achieve its strategic objectives and be successful, basic business assumptions need to be in place and business

imperatives have to be defined and given effect to (Boshoff, 2014). Boshoff (2014) provides the following guidance, which should be taken into account when aligning IT with business.

According to Boshoff (2014) the business context is determined by the business model of a company, which provides the context of what needs to be governed in a particular company. This business context should determine the strategic IT context of the company, which in turn should define its operational IT context. This structured progression of ultimately defining the operational IT context of a company can only be achieved by aligning business imperatives with the IT architecture of the company, while taking the maturity of IT implemented in the company into account.

Business imperatives act as the key drivers of the company and give the company a competitive advantage in its specific environment (Boshoff, 2014). Business imperatives are driven by the context of the company and determines what needs to be governed in an IT governance context (Boshoff, 2014). IT architecture refers to the conceptual design of the IT components and the interrelationship between such components (Boshoff, 2014). IT architecture directs the specific IT components that will be selected within the planned architecture in order to align IT with the enterprise's business imperatives (Boshoff, 2014). The impact of business imperatives on the IT infrastructure of a company, together with the basic business assumptions of a company, should determine the overall IT strategy of a company (Boshoff, 2014).

Basic business assumptions relate to the way in which the company's operations will be managed. In order for a company to perform its basic everyday functions effectively and efficiently within its specific business environment, it is absolutely necessary to define its basic business assumptions. Therefore the basic business assumptions are assumed to be in place in every company. Business imperatives, on the other hand, expand beyond the basic business assumptions and are those critical driving forces of a company which need to be executed extraordinarily well for a company to meet its strategic objectives (Boshoff, 2014).

The impact of business imperatives on IT architecture needs to be determined in order to determine the access path components and the process surrounding each component (i.e. the build, setup, configuration, operating and maintenance of each component) (Boshoff, 2014).

In the guidance provided above, Boshoff (2014) uses the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap, by

designing IT architecture, as well as the access path components and access path processes, which will support the successful execution of the business imperatives of a particular company in order to ultimately achieve alignment between business and IT on a component level. This hypothesis will be referred to as “the hypothesis” for the purpose of this study and the validity of the hypothesis will be tested as part of the study. The guidance provided above will assist companies to integrate their IT strategies with their overall business strategy and business processes (IT governance principle 5.2 according to King III) on a component level, which will lead to the bridging of the IT gap (Boshoff, 2014).

This study seeks to answer the following two research questions:

- **Research question 1:** Should business imperatives be used as the basis to bridge the IT gap and achieve alignment between business and IT within a company?

  This question will be addressed, and the hypothesis validated, by mapping a list of general, intuitively compiled, business imperatives to the business model canvas and the Control Objectives for Information and Related Technologies (COBIT) 5th edition (COBIT 5) enabling processes and its underlying governance practices. This will be done in order to determine which business imperatives can be defined as drivers of the business and could be used as the basis to design IT architecture, as well as the access path components and access path processes, to bridge the IT gap. These business imperatives will be referred to as “validated business imperatives” for the purpose of this study. The validation of business imperatives will support the successful execution of the business imperatives of a particular company in order to ultimately achieve alignment between business and IT on a component level.

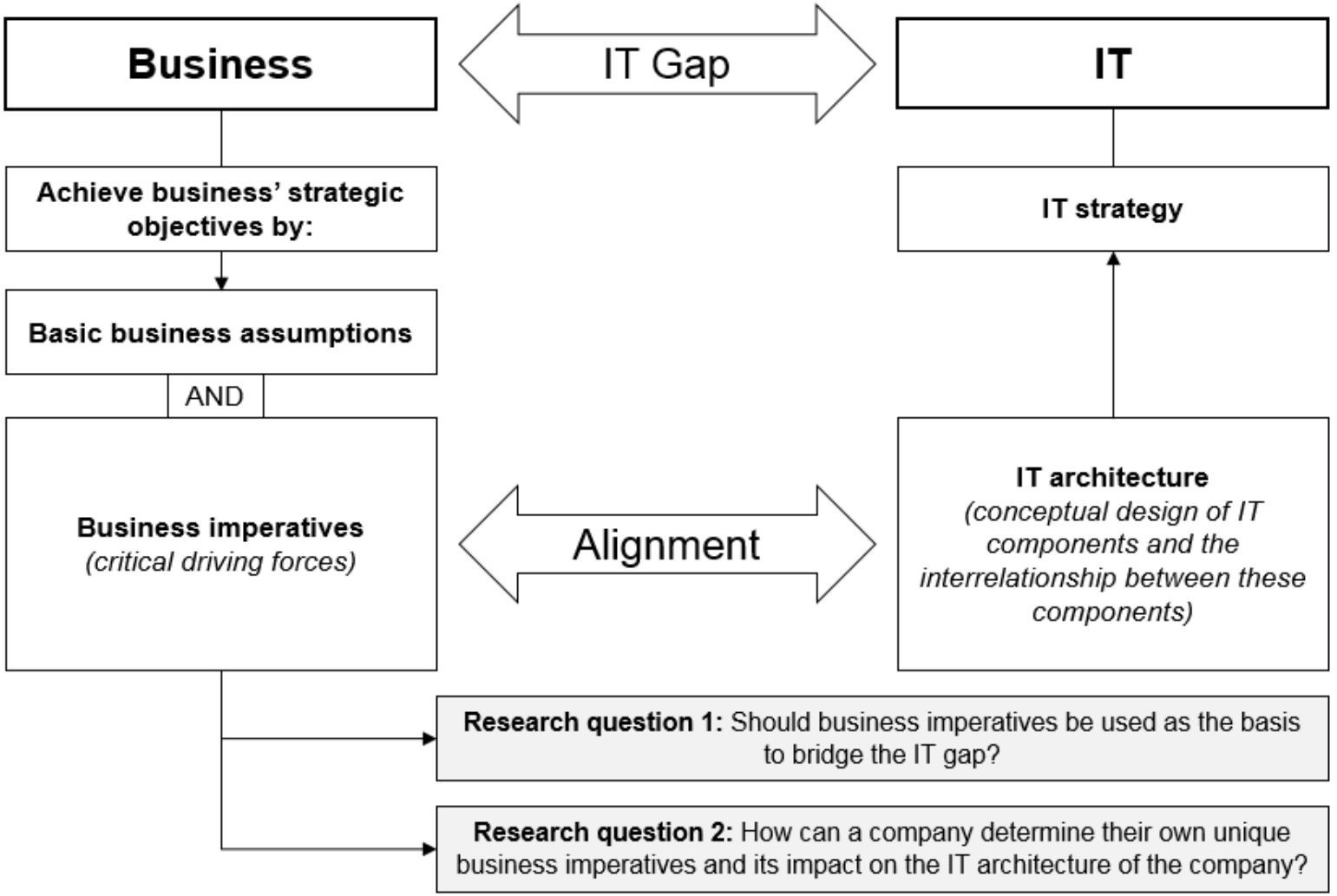
- **Research question 2:** If business imperatives could indeed be used as the basis to bridge the IT gap and achieve alignment between business and IT within a company, how can a company determine their own unique business imperatives and its impact on the IT architecture of the company?

  This question will be answered by providing a list of validated business imperatives which companies can use to identify the business imperatives relevant to their own company. The second part of the question, being how business imperatives impact the IT architecture of a company, will be answered in two ways. Firstly, an explanation of the impact business imperatives have on IT architectures will be provided for companies to determine the impact of their business imperatives on their own IT

architectures. Secondly, a list of potential ways in which the IT architecture of a company can be impacted will be created and mapped to the validated business imperatives to create a framework and provide guidance to companies on a number of ways in which their business imperatives can impact their IT architectures.

The steps which will be taken in this study in order to address the research questions above, are summarised in section 2.2. Refer to Figure 1 below for an illustration of the research problem and research questions as explained above.

Figure 1: Illustration of the research problem and research questions



1.3 Research objective and scope of research

This study proposes to address the lack of guidance provided to companies relating to the alignment between IT and business objectives upon implementation of IT solutions, as required by the IT governance principle 5.2 of King III. The objective of this study is to validate the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap by designing IT architecture, as well as the access path components and access path processes, which will support the successful execution of the business imperatives of a particular company in order to ultimately achieve alignment between business and IT on a component level. This research proposes to provide both senior management of the business and IT specialists with practical guidance to bridge the IT gap by assisting them to:

- Identify and define their business imperatives; and
- Determine the impact of their business imperatives on the IT architecture of their company.

1.4 Limitations of the study

This study will focus on testing the aforementioned hypothesis used by Boshoff (2014) by mapping a list of business imperatives, which has been compiled intuitively based on books, accredited articles, electronic sources, unpublished class notes and previous theses, to the business model canvas and the COBIT 5 enabling processes and governance practices, to determine whether the business imperatives do indeed act as drivers of the business and whether it can be used as the basis to bridge the IT gap.

The following fall outside the scope of the study:

- Providing a complete list of business imperatives. This study will validate a wide-ranging list of generic business imperatives and provide guidance on the impact of each of the validated business imperatives on the IT architecture of a company. The completeness of the list of business imperatives can however not be tested as business imperatives depend on the business context, which is different for each company;
- Providing a complete list of potential ways in which IT architecture can be impacted;
- Selecting specific access path components to be included in the IT architecture;

- The impact of IT architecture on access path components and the process surrounding each component (i.e. the build, setup, configuration, operating and maintenance of each component);
- Discussing potential risks relating to the implementation of IT solutions; and
- Suggesting controls to be implemented in addressing risks relating to the implementation of IT solutions.

1.5 Structure of research

This study consists of five chapters and is structured as follow:

- **Chapter 2: Research Design and Methodology** describes the design and methodology of the research and includes the process followed in answering the research questions.
- **Chapter 3: Literature Review** forms the foundation of the study and defines important concepts applicable to this research. The literature review also includes the review of historical research.
- **Chapter 4: Findings** contains the framework that was developed to achieve alignment between business and IT objectives while adhering to IT governance principles (hereafter referred to as “the framework”).
- **Chapter 5: Conclusion** contains a summary of the research conducted during the study, highlighting the conclusions of the study.

CHAPTER 2: RESEARCH DESIGN AND METHODOLOGY

2.1 Purpose of the study

IT is developing at a tremendous rate, which has a major impact on all aspects of companies and the industries they operate in. As a result, senior management of companies need to ensure that the IT objectives of their companies are aligned with its business objectives in order for IT to add value to the company.

To achieve alignment between business and IT, the business context of a company, which is determined by its business model, should drive its IT control environment at both a strategic and operational level (Boshoff, 2014). According to Khan *et al.* (2016) the first step in bridging the IT gap is aligning IT's role with the overall business objectives of a company. Boshoff (2014) agrees that business-IT alignment can only be achieved when the IT architecture of a company is aligned with its business imperatives.

The objective of this study is to provide the senior management of the business with practical guidance to bridge the IT gap by identifying their business imperatives and determining the impact of their business imperatives on the IT architecture of their company. Structured guidance on the implementation of IT solutions will ensure adherence to the governance principles contained in King III, particularly the principles relating to IT supporting the company's strategic objectives (IT governance principle 5.2) and adding value to the company (IT governance principle 5.4). The guidance will take the form of a framework, providing companies, primarily, with a list of generic, validated, business imperatives, along with the descriptions thereof, which can assist companies to identify the business imperatives which serve as drivers of their particular company. Secondly, the framework will highlight the business requirements necessary to execute each of the generic business imperatives. Lastly, the framework will explain the impact of the business requirements on the IT architecture of the company and thus provide companies with guidance as to the manner in which the IT department can support the business in order to execute each of the generic business imperatives and ultimately achieve its business objectives and bridge the IT gap.

2.2 Research methodology

The framework developed in this study consists of a list of validated business imperatives, the business requirements for each business imperative and ultimately the impact of each business imperative on the IT architecture of a company. The following steps were taken to develop the framework:

Step 1: Perform a literature review to gain an understanding of business imperatives, and the hypothesis that business imperatives serve as drivers of a company which should be used as the basis to bridge the IT gap. Based on this understanding, a list of business imperatives was compiled intuitively.

Step 2: Investigate various IT governance frameworks and business model design tools. Select the two most appropriate frameworks to validate the concept of business imperatives and the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap.

Step 3: Perform a detailed study of the appropriate IT governance framework and business model design tool chosen in Step 2 in order to determine the aspects relevant to the business imperatives compiled in Step 1.

Step 4: Align the relevant information obtained from the appropriate IT governance framework and business model design tool in Step 3 with the business imperatives compiled in Step 1. Refer to the mapping as shown in Appendices I and III.

Step 5: Identify areas of overlap, which would indicate validated business imperatives that act as the drivers of a company and which should be used as the basis to bridge the IT gap. These are the business imperatives that will be used to design IT architecture, as well as the access path components and access path processes, which will support the successful execution of the business imperatives of a particular company in order to ultimately achieve alignment between business and IT on a component level.

Step 6: Provide guidance on the impact that business imperatives have on the IT architecture of a company in order for senior management to design the IT architecture of their companies in alignment with its identified business imperatives.

Step 7: Develop a list of possible business requirements necessary to execute the generic, validated business imperatives identified in Step 5 by a review of theses, books, white papers, accredited articles, media articles, unpublished class notes and electronic sources. Refer to Appendix IV.

Step 8: Develop a list of possible areas of IT architecture and specific enabling technologies which could assist companies in giving effect to its business imperatives by a review of theses, books, white papers, accredited articles, media articles, unpublished class notes and electronic sources. Refer to Appendix V.

Step 9: For each of the validated business imperatives, determine which of the business requirements, formulated in Step 7, are needed to give effect to the validated business imperatives, and determine the impact of the business requirements on the areas of IT architecture of a company, formulated in Step 8.

The framework that will be developed by following the steps as discussed above, will assist companies to implement IT solutions and design its IT control environment in such a way that it will support alignment with the company's business objectives while adhering to the IT governance principles of King III, as well as global IT governance principles.

2.3 Literature review methodology

In order to gain an understanding of business imperatives and its impact on IT architecture, providing the IT governance principles of King III and in order to validate the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap in order to ultimately achieve alignment between business and IT on a component level, a non-empirical, qualitative study was performed.

According to Kelly (2011:2) and Sylvester, Tate and Johnstone (2011:1199) the literature review is a vital element in research studies and it is through the literature review that the researcher identifies gaps in research in order to formulate an appropriate research question.

The literature review is the portion of research where reference is made to related studies and it highlights the current study's position amongst related literature (Ridley, 2012:3). According to Ridley (2012:25-39) and Kelly (2011:3) the literature review should include the following elements:

- Historical background and context of the research;
- Theories and concepts relevant to the research;
- Definitions and terminology referred to in the research; and
- Critical findings and gaps in prior studies which the research seeks to address.

An extensive literature review was performed. Theses, books, white papers, accredited articles, media articles, unpublished class notes and electronic sources were considered in the literature review. The literature review covered the following aspects:

- The concept of the IT gap;
- The importance of business-IT alignment;
- The relevance of the framework and the role it plays in achieving business-IT alignment;
- A historic review of prior research on the IT gap as well as the role business models play in achieving business-IT alignment;
- The role of basic business assumptions and business imperatives in achieving business-IT alignment;
- The role of business models, and specifically the business model canvas, in achieving business-IT alignment and validating the concept of business imperatives;
- The concept, goal and meaning of IT governance;

- The importance of IT governance as a subset principle of corporate governance, in terms of King III;
- The concept of IT architecture and the impact of business imperatives on IT architecture; and
- The role of COBIT 5 in achieving business-IT alignment and validating the concept of business imperatives.

The literature review performed highlights gaps in prior studies and forms the basis of this study by defining theories and concepts relevant to the research and explaining its relevance to this study.

CHAPTER 3: LITERATURE REVIEW

3.1 Introduction

This study proposes to provide senior management with guidance to bridge the IT gap by defining their business imperatives and determining the impact of these business imperatives on the IT architecture of their company. This chapter provides the literature review that was performed on the core concepts fundamental to this research and the development of the framework. The literature review was done in order to obtain an understanding of these concepts and their roles in achieving business-IT alignment necessary to bridge the IT gap.

3.2 Corporate Governance

In the *Report of the Committee on the Financial Aspects of Corporate Governance*, also known as the Cadbury Report (Cadbury, 1992:5), corporate governance is defined as “the system by which companies are directed and controlled”. Since the Cadbury Report was released in 1992 the definition of corporate governance has evolved and a number of definitions have emerged. The central theme of corporate governance have however remained consistent throughout the development of these definitions.

Tricker (2015:4) suggests that in essence corporate governance refers to the way in which power is exercised over companies and the actions taken by the board of directors and their relationship with all stakeholders. Therefore, good corporate governance essentially refers to ethical, efficient and responsible leadership in corporate entities. In the South African context, King III echoes the spirit of corporate governance as defined internationally by describing corporate governance as follows: “Good corporate governance is essentially about effective, responsible leadership. Responsible leadership is characterised by the ethical values of responsibility, accountability, fairness and transparency” (Institute of Directors Southern Africa, 2009:20). Ethical leadership encompasses a board of directors who assumes responsibility for the actions taken on behalf of the entity, is able to account for and justify these actions, considers the interests of all stakeholders of the entity carefully and disclose information to the stakeholders in order to enable them to base their decisions on all relevant facts (Institute of Directors Southern Africa, 2009:20-21).

Following the study of the various definitions provided above, good corporate governance is defined, for the purpose of this study, as the ethical exercising of power in a company, in particular by the board of directors, by means of efficient and responsible leadership, while taking the best interest of all stakeholders into account.

3.3 Basic business assumptions and business imperatives

According to King III principle 1.1, one of the board of directors' main responsibilities regarding corporate governance is determining the strategic direction of the company (Institute of Directors Southern Africa, 2009:20). Various mechanisms need to be implemented in a company in order to meet its strategic objectives. According to Boshoff (2014) "there are many essential things that need to be done for a company to survive (referred to as basic business assumptions) but there are only a few things that are absolutely crucial, which need to be done exceptionally well for a company to succeed in a specific geography, industry, segment (referred to as business imperatives)." There are consequently two layers of functions that need to be performed in order for a company to achieve its strategic objectives, namely basic business assumptions and business imperatives.

3.3.1 Basic business assumptions defined

According to Boshoff (2014) basic business assumptions needs to be implemented by a company and are essential in order for a company to survive. Basic business assumptions relate to the way in which the company's operations are managed. In order for a company to perform its basic everyday functions effectively and efficiently in its specific business environment, it is absolutely necessary to attain its basic business assumptions. Therefore the basic business assumptions are assumed to be in place in every company and is not unique to specific companies or industries. Examples of basic business assumptions include, *inter alia* (Boshoff, 2014) that all companies:

- Are profit orientated;
- Transact across all business processes (i.e. the purchases and payments, inventory and production, revenue and receipts, human resources and the investments and financing processes (Penning, Butler, Nathan, Kunz, Motholo, O'Reilly, Rudman & Scholtz, 2014:119));
- Comply with general laws and regulations applicable to all companies, for example keeping accounting records (laws and regulations specific to a certain industry would, for example, not be seen as a basic business assumption);

- Value customer relationships and manage it accordingly;
- Manage information; and
- Consider cash flow to be of critical importance and aim to continue as a going concern in the foreseeable future to ensure business continuity.

Basic IT solutions and internal controls are implemented in order to govern basic business assumptions. Internal controls address the risks within all the phases in the accounting system, being initiation, execution, recording, processing and reporting (Penning *et al.*, 2014:117), of each transaction in each of the business processes.

Without such IT solutions and internal controls, the company will not be able to operate on a day-to-day basis. This, however, does not constitute business-IT alignment. The IT gap can only be bridged when alignment is achieved at the next level of business functions, namely business imperatives (Boshoff, 2014).

3.3.2 Business imperatives defined

According to Boshoff (2014) business imperatives expand beyond the basic business assumptions and are those essential driving forces which need to be implemented in a company and executed extraordinarily well for a company to meet its strategic objectives. Strategic alignment between business and IT can only be achieved from the business imperatives-level (Boshoff, 2014). Ali and Green (2012:178-179) reaffirm this statement by highlighting the importance of understanding each company's unique characteristics and tailoring IT governance mechanisms for each company based on these characteristics. This will ensure the effectiveness of the IT governance procedures implemented.

A hypothesis therefore exists that business imperatives act as the drivers of the company and that the successful execution of business imperatives will give the company a competitive advantage in its specific environment (industry, geographical distribution, company size, strategy and degree of dependence on IT (IT Governance Institute (ITGI), as referenced by Goosen, 2012:18)). Conversely, business imperatives are driven by the context of the company and determines the IT architecture which has to be governed (Boshoff, 2014).

This study aims to validate the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap by designing IT architecture, as well as the access path components and access path processes, which will support the

successful execution of the business imperatives of a particular company in order to ultimately achieve alignment between business and IT on a component level. The framework that will be developed as part of this study will assist companies in identifying their unique business imperatives and determining the impact of their business imperatives on their IT architecture, in order to achieve strategic business-IT alignment.

3.4 The business model canvas

3.4.1 Business model defined

Business imperatives are determined by the context of a company (Boshoff, 2014). This context consist of internal factors relevant to a company as well as external forces (Boshoff, 2014). The internal factors, which contribute to the unique context of a company, can be summarised by its business model, which is in turn continually influenced by the external forces surrounding a company.

A business model is a theoretical tool which contains the elements of a company and the relationships between these elements (Osterwalder, Pigneur & Clark, 2010). A business model represents a company's money earning logic as well as the way in which a company will create, deliver and capture value to one or more customer segments in order to produce revenue streams (Teece, 2010:174; Osterwalder & Pigneur, 2005:13; Osterwalder, 2004:15). A business model forms part of the architectural level, linking the planning and strategic layer (including *inter alia* the vision, mission and strategic goals) as well as the implementation and process layer (comprising of *inter alia* the organisational structure, units, processes and workflow) of a company, providing the business context and the mechanisms on how to achieve the company's strategic objectives (Osterwalder, 2004:14).

The business model of a company is continually exposed to ever-changing internal and external forces. External influences include competition, social, legal or technological changes as well as changes in customer requirements. The design of the business model will therefore need to take the aforementioned factors into account (Osterwalder, 2004:16) and each company's business model will be unique as a result of these factors. Boshoff (2014) corroborates this statement by claiming that a business model is surrounded by its global, local and industry context as well as the level of maturity of the company, which includes the maturity of IT solutions utilised.

The concept of business models was only brought under the attention of the public over the last couple of decades. The main driving force behind the growing necessity for business models is the significant change in companies' money-earning logic over the past few decades (Osterwalder, 2004:18-19). New possibilities were presented mainly as a result of the introduction of the internet in the business-world and the sudden increase in affordable IT solutions, bandwidth and improved communication opportunities (Teece, 2010:174; Osterwalder & Pigneur, 2005:6-7).

3.4.2 The business model canvas defined

The business model canvas is a tool which allows companies to describe, design, challenge and invent their business models (Osterwalder *et al.*, 2010). In his business model ontology, Osterwalder (2004:42-43) emphasises four areas a business model needs to address, namely product, customer interface, infrastructure management and financial aspects. These four areas are further broken down into nine building blocks (Osterwalder *et al.*, 2010:16-17), which assists companies in aligning their activities by demonstrating potential trade-offs and, together, is referred to as the business model canvas. Spieth, Schneckenberg and Ricart (2014:243) found that the business model canvas is one of the most popular tools to use in the design of a company's business model and is widely adopted in corporate practice for this purpose. Refer to Table 1 for a description of the nine building blocks of the business model canvas and its mapping to the four main focus areas of business models as demonstrated by Osterwalder *et al.* (2010:16-17) and Osterwalder (2004:43).

Table 1: The four areas and nine building blocks of the business model canvas

Nine building blocks of the business model canvas and their descriptions	**The four main areas of the business model ontology**
1. Customer segments defines the target market of the company, i.e. who the company is creating value for and who the most important customers are.	Customer interface
2. Value propositions aims to satisfy customer needs and help solve customer problems. The value proposition therefore refers to the product or service delivered to the customer segment identified.	Product
3. Channels refer to the interface with the identified customer segment in order to deliver the value proposition and include *inter alia* distribution, communication and sales channels.	Customer interface
4. Customer relationships are established with each customer segment and should be aligned with customer expectations.	Customer interface
5. Revenue streams result from successfully delivering the required value proposition to the relevant customer segment.	Financial aspects
6. Key resources refer to the assets required to offer the value proposition to the customer segment identified by means of the relevant channels, while maintaining good customer relationships and thereby generating a revenue stream. Categories of key resources include physical, intellectual, financial assets and human capital.	Infrastructure management
7. Key activities need to be performed in order to offer the value proposition to the customer segment identified by means of the relevant channels, while maintaining good customer relationships and thereby generating a revenue stream. Categories of key activities include production, problem solving and providing a platform / network.	Infrastructure management
8. Key partnerships refer to third parties performing activities or delivering resources required.	Infrastructure management
9. Cost structure is required to deliver the value proposition to the customer segment through the relevant channels, while maintaining	Financial aspects

customer relationships and generating a revenue stream. Costs will be incurred when obtaining key resources, fully or partially from key partners, and conducting key activities.	

(Source: Osterwalder *et al.*, 2010:16-17; Osterwalder, 2004:43)

In a recent study, Wirtz, Pistoia, Ullrich and Göttel (2015:7) analysed business model definitions, perspectives and components from sixteen different sources in order to obtain an overall view of business models and identify the elements critical to the concept of business models. According to this study the components (i.e. building blocks) of business models identified by Osterwalder *et al.* (2010:16-17) in the development of the business model canvas cover all of the elements identified in the mapping performed, except for two, namely strategy and procurement. Refer to the Figure 2 below for the mapping performed.

Figure 2: Mapping to identify the elements critical to the concept of business models

Compo-nent / Author	Strategy	Resources	Network	Customers	Market offering (value proposition)	Revenues	Service provision	Procure-ment	Finances	Spectrum of the Components
Hamel (2000)	Core Strategy, Strategic Resources		Value Network	Customer Interface						◔
Mahadevan (2000)			Logistic Stream		Value Stream	Revenue Stream				◔
Wirtz (2000)	Combination of production factors for strategy implementation	Core competencies & Core assets		Market & customer segmentation	Service offer & Value proposition	Systematization of revenue forms	Combination & transformation of goods & services	Production factors & Suppliers	Financing & Refinancing	◕
Hedman/Kalling (2002)	Managerial and organizational, longitudinal process component	Resources		Customers	Competitors, Offering		Activities & Organization	Factor & Production Input Suppliers		◕
Bouwman (2003)		Technical architecture		Customer Value of Service					Financial arrangements	◔
Afuah (2004)	Positions	Resources			Industry Factors		Activities		Costs	◑
Mahadevan (2004)				Target Customers	Value Proposition	Revenue Model	Value Delivery			◔
Voelpel/Leibold/ Tekie (2004)		Leadership capabilities	Value Network (Re)Configuration for the Value Creation		Customer Value Proposition					◔
Yip (2004)	Scope, Differentiation	Organization		Nature of Customers, Channels	Value Proposition, Nature of Outputs		How to transform inputs (including technology)	Nature of inputs		◕
Lehmann-Ortega/Schoettl (2005)					Value Proposition, Value Architecture	Revenue Model				◔
Osterwalder/ Pigneur/Tucci (2005)		Core Competency	Partner Network	Target Customer, Distribution Channel, Relationship	Value Proposition	Revenue Model	Value Configuration		Cost Structure	◕
Tikkanen et al. (2005)	Strategy & Structure		Network				Operations		Finance & Accounting	◑
Al-Debei/El-Haddadeh/Avison (2008a)			Value Network		Value Proposition, Value Architecture				Value Finance	◔
Demil/Lecocq (2010)		Resources & Competences, Organization			Value Proposition	Volume & Structure of Revenue Streams			Volume & Structure of Revenue costs	◑
Johnson (2010)		Key Resources			Customer Value Proposition	Profit Formula	Key Processes			◑
Osterwalder/ Pigneur (2010)		Key Resources	Key Partners	Customer Relationships, Channels, Customers Segments	Value Proposition	Revenue Streams	Key Activities		Cost Structure	◕
Intensity of use	◑	◕	◑	◑	◕	◑	◑	◔	◑	

○ Very low ◔ Low ◑ Moderate ◕ High ● Very high

(Source: Wirtz *et al.*, 2015:7)

Components identified by the business model canvas (Osterwalder *et al.*, 2010).
Please note: the source referred to as "Osterwalder and Pigneur (2010)" in Figure 2 is referred to as "Osterwalder et al. (2010)" in this study.

Osterwalder (2004:14) and Osterwalder *et al.* (2010) excludes the strategy component from the business model canvas as he views the place of the business model in a company as a link between the strategic and process layers of an entity. Osterwalder (2004:17) argues that a business model and business strategy address the same issues, but on different business layers. Osterwalder (2004:17) describes the business model as "the strategy's implementation into a conceptual blueprint of the company's money earning logic. In other words, the vision of the company and its strategy are translated into value propositions, customer relations and value networks". Even though Hamel (2000:70), amongst others, identifies core strategy as one of the major components of a business model (refer to Figure 2), strategy ultimately provides critical guidance to the business model (Wirtz *et al.*, 2015:6; Osterwalder, 2004:17) and should therefore not necessarily form a part of the business model.

Procurement is addressed by the business model canvas in the "key partners" building block. Key partners, according to Osterwalder *et al.* (2010:38-39) include key suppliers and consequently the management of a company's relationship with these suppliers. Only three of the sixteen definitions of business models studied by Wirtz *et al.* (2015:7) contain a separate component for procurement and the researchers consequently found this specific component to be of low importance to the concept of business models. Therefore it can be concluded that procurement does not need to be addressed as a separate component and it is sufficient to include it in the "key partners" building block.

Based on this analysis, the elements addressed in the business model canvas is regarded as sufficient to design business models for companies.

The business model of each company will depend on their own unique characteristics, as portrayed by the nine building blocks, as well as the industry the company operates in. The individual building blocks need to be designed with reference to each other, taking the relationship between the various elements into account (Teece, 2010:188). This approach will encourage senior management of the business to identify the elements critical to the success of their specific company and therefore enable them to formulate their business imperatives.

3.4.3 The building block of the business model canvas summarised

Osterwalder *et al.* (2010:16-41) identify subsections of the nine building blocks (refer to Table 1) of the business model canvas, which are summarised in Table 2. According to Osterwalder *et al.* (2010:15) the best way to describe the business model is by referring to the nine building blocks and the detailed explanations thereof. The explanations take the form of elements and practical examples of the building blocks. For the purpose of this study these subsections of the nine building blocks will be used to validate the hypothesis that business imperatives act as the drivers of a company.

Table 2: The nine building blocks of the business model canvas explained

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder *et al.* (2010)
1. Customer segments		*As a company cannot be profitable without its customers, it is important to identify various groups of customers and decide how each group should be served best to meet their needs. A company can also decide to ignore a specific group of customers, if serving them would not prove to be profitable. The customer segment(s) a company wishes to build its business model around will determine the Value Propositions, Distribution Channels and Customer Relationships.*
	*Mass market	A business model which focusses on a mass market does not distinguish between various customer segments and treat all customers the same way.
	*Niche market	A business model which focusses on a niche market targets a specific customer segment.
	*Segmented	A business model can differentiate between market segments with similar but slightly varying needs and problems.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder *et al.* (2010)
	*Diversified	A business model which focusses on diversified customer segments serves two or more unrelated customer segments with different needs and problems.
	*Multi-sided platforms	A business model which focusses on multi-sided markets serve two or more interdependent customer segments.
2. Value propositions		*The Value Proposition represents the value a company creates for its customer segments to meet their needs. Value may be quantitative (for example the speed of service or the price of the product or service) or qualitative (for example the customer experience or the design of the product). Some value propositions are innovative while others are similar to that of its competitors, with slightly different attributes.*
	*Newness	Some value propositions are entirely unique and meet a new set of customer needs.
	*Performance	Some value propositions focusses on improving the performance of existing products or services. Computers, for example, can become more powerful or more user-friendly over time.
	*Customisa-tion	Some value propositions target specific needs of individual customer segments or customers by tailoring products or services.
	*"Getting the job done"	Some value propositions focus on "getting the job done" by outsourcing certain functions, reducing cycle times and increasing productivity.
	*Design	Value can be created by superior design, which could translate into superior quality or the exclusivity of a product.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder *et al.* (2010)
	*Brand / status	Value can be created by the exclusivity of a product, which is encapsulated in a specific brand.
	*Price	Some value propositions focus on offering products or services of similar value at a lower cost to cater for price sensitive customers.
	*Cost reduction	Value can be created by helping customers reduce their costs, by offering products or services at lower costs or adding incremental value for the same cost.
	*Risk reduction	Value can be created by helping customers reduce the risks they might be exposed to when buying a product or service. Service guarantees on the purchase of a car or after-sales service are examples of risk reduction.
	*Accessibility	Value can be added by making products or services available to customers who previously did not have access to it. Making products or services more affordable is one way of achieving accessibility. Innovation by means of technology also creates opportunities for companies to make their products or services more accessible to the public.
	*Convenience / usability	Making products or services easier to use can create value. Innovation by means of technology can create opportunities for convenience. E-commerce is an example of convenience added to current products or services of a company.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder et al. (2010)
3. Channels		*Communication, distribution and sales channels represent how a company communicates with and reaches its customers. A company can use one or more types of channels. While partner channels introduce many options which can expand the reach of the company, it leads to lower margins. Owned channels, on the other hand, lead to higher margins but the cost associated with it is very high.*
Channels serve various functions, summarised in the following phases:		
	*Awareness	Awareness represents the manner in which a company creates awareness about its products and services among customers.
	*Evaluation	The evaluation phase creates an opportunity for customers to evaluate a company's products and services.
	*Purchase	The purchase phase provides a way for customers to purchase the company's products and services.
	*Delivery	The delivery phase represents the way in which a company's products and services are delivered to its customers.
	*After sales	Providing after-sales service to customers represent the last phase of the Channels building block.
Various types of channels:		
	*Direct owned channel: sales force	An example of a direct channel is a centralised in-house sales force.
	*Direct owned channel: web sales	An example of a direct channel is a website owned by the company.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder et al. (2010)
	*Indirect owned channel: own stores	Distributed retail stores can be owned and operated by the company.
	*Indirect partner channel: partner stores	Retail stores can be owned and operated by a business partner. While partner channels introduce many options which can expand the reach of the company, it leads to lower margins. Companies incur less costs if operated via partner stores as opposed to owned stores.
	*Indirect partner channel: wholesaler	Products or services can be distributed via partner wholesale distribution. While partner channels introduce many options which can expand the reach of the company, it leads to lower margins. Companies incur less costs if operated via partner stores as opposed to owned wholesale outlets.
4. Customer relationships		*Customer relationships can range from personal assistance to automated service. A company needs to decide which type of customer relationship is appropriate for each of its customer segments.*
	*Personal assistance	Personal assistance involves human interaction by means of, among others, a call centre, e-mail correspondence or interaction at a point-of-sale.
	*Dedicated personal assistance	Certain customers can be allocated their own dedicated assistant. Dedicated personal assistance represents a relationship that develops over time and is the most meaningful customer relationship possible.
	*Self-service	When a company provides customers with all the tools necessary to help themselves, it is referred to as self-service. This enables a company to keep direct contact with its customers.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder et al. (2010)
	*Automated services	As the name suggests, automated service is an automated process which simulates personal service. A customer profile is typically created, according to which information can be offered to customers based on their individual characteristics and previous actions.
	*Communities	By maintaining online communities customers can assist each other by solving one another's problems and share knowledge about the company's products and services.
	*Co-creation	Co-creating content with customers has become popular in certain industries. On-line reviews of, for example, books and restaurants can be created by customers. Certain companies even go as far as basing their entire business model on co-creation. YouTube.com, for example, requests customers to create content for public consumption.
5. Revenue streams		*Revenue streams represents the money a company generates and illustrates the value customers are willing to pay for the products or services a company delivers.*
	*Asset sales	Revenue is generated by transferring ownership rights associated with a physical product from the company to the customer.
	*Usage fees	Revenue is created by giving customers the right to use a particular service.
	*Subscription fees	Revenue is created by selling access to a service for a prolonged period of time.
	*Lending/ renting/ leasing	Revenue is generated by giving a customer the exclusive right to use a specific asset for a fixed period of time in exchange for a fee.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder et al. (2010)
	*Licensing	Revenue is created by giving a customer the right to use intellectual property, which is protected in return for a licensing fee.
	*Brokerage fees	Revenue is earned by intermediating on behalf of two or more parties.
	* Advertising	Revenue is generated by advertising a product or service on behalf of another party.
6. Key resources		*The key resources needed as part of a company's business model depend on the type of company and the industry it operates in.*
	*Physical	Physical resources include physical assets which are key to a company's operations, such as manufacturing facilities, point-of-sale systems, vehicles, buildings, machines and distribution networks. Physical resources are an important part of business models of companies who rely heavily on, *inter alia*, multiple retail branches or manufacturing plants.
	*Intellectual	Intellectual resources include, among others, brands, patents, copyrights, proprietary knowledge, partnerships and customer databases. Companies who rely on the exclusivity of its brand or knowledge generated by its staff members, like research institutes, are examples of where intellectual resources would be critical to its business model.
	*Human	Staff members are important to all companies but certain companies, for example knowledge intensive companies or companies requiring creative staff members, rely on its human resources.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder et al. (2010)
	*Financial	Certain business models require financial guarantees and/or financial resources like stock options, cash or credit.
7. Key activities		*Key activities refer to the key actions a company must take to be successful.*
	*Production	Production as a key activity refers to designing, making and delivering a product of superior quality and/or in considerable volumes. Manufacturing companies are driven by the production key activity.
	*Problem solving	Problem solving refers to designing unique solutions to individual customers' problems. Knowledge management and training is critical for companies such as consulting firms or hospitals.
	*Platform/ network	Companies who own a network / platform as a key resource should prioritise network / platform related activities as key activities. Examples of such activities relate to platform promotion, providing services and platform management.
8. Key partnerships		*Companies create alliances with strategic partners for a number of reasons. The four main types of partnerships are:* **Strategic partnerships between non-competitors;* **Strategic alliance between competitors;* **Joint ventures; and* **Buyer-supplier relationships.*
	*Optimisation and economy of scale	Buyer-supplier relationships are aimed at optimising economies of scale. Buyer-supplier relationships reduce costs as it entails the sharing or outsourcing of certain resources.

Building blocks of the business model canvas	Subsections of the building blocks	Explanation of the building blocks and their sub-sections, according to Osterwalder et al. (2010)
	*Reduction of risk and uncertainty	Partnerships between competitors can reduce risk when working towards a common goal in an uncertain environment.
	*Acquisition of particular resources and activities	Certain industries are dominated by a small amount of companies. These companies can work together by relying on resources or activities performed by another company in the relevant industry.
9. Cost structure		*The cost structure of a business model describes all of the costs incurred in a company.*
	*Cost-driven	Cost-driven companies typically focus on reducing costs at every possible opportunity. These companies typically provide low cost products or services to its customers. Cost-driven companies could potentially rely on automation and outsourcing.
	*Value-driven	Value-driven companies depend on the quality of the products or services it delivers. These companies normally deliver a high level of personalised customer service.

(Source: Osterwalder *et al.*, 2010:16-41)

3.4.4 The relevance of the business model canvas to the proposed framework

The framework that is developed in this study aims to assist companies to achieve alignment between business and IT objectives. The basis of the framework will consist of business imperatives, the drivers of a company which need to be implemented and executed particularly well for a company to meet its strategic objectives. The impact of business imperatives on the IT architecture will be determined in order to align IT with business.

It is of utmost importance to take the business context into account when formulating the business imperatives of a company, as this context plays a critical role in determining the

driving forces behind achieving the strategic objectives of a company (Boshoff, 2014). The business context also provides the company with a much needed frame of reference relating to governance requirements in a specific company. In order to ultimately achieve business-IT alignment and ensure that IT-investments contribute to the success of a company, these business imperatives have to be aligned with the strategic IT context of a company.

According to Teece (2010:192) a significant contributing factor to the failure of IT-investments is the fact that business models are hardly ever properly understood and designed. On the other end of the spectrum, well-constructed business model design and implementation, together with strategic analysis, will improve the chances for technological innovation to succeed (Teece, 2010:184). A sound understanding of a business model, and its alignment with the IT architecture of a company, is therefore essential to ensure that IT-investments contribute to the success of a company.

Chesbrough (2010:358) found that business leaders are hesitant to experiment with business model innovation as it is a relatively young concept. Consequently, innovative IT solutions are implemented without updating the business model of the company and determining its impact on the IT architecture of the company. It is therefore unclear where the IT solution fits into the company or which objectives it aims to address, and misalignment between business and IT becomes inevitable. Teece (2010:186) therefore states that “technological innovation often needs to be matched with business model innovation if the innovator is to capture value”.

Chesbrough (2010:359) recommends using the business model canvas developed by Alexander Osterwalder, which, according to Chesbrough, represents a sound method to design various hypothetical business models and to clarify the processes underlying a business model. This will allow a company to experiment with various combinations of these underlying processes. The business model canvas can therefore be used by companies to ensure a shared understanding of the business model by all parties involved, thereby ensuring that technological innovation is aligned with the business model, which will contribute to the success of the company.

Osterwalder (2004:16) describes the business model’s position in the company as a theoretical link between business strategy, information and communication technology and business organisation. Clearly defined business models can facilitate communication between these three parties, which in turn will reduce the IT gap (Osterwalder, 2004:16).

The building blocks of the business model canvas and their sub-categories (summarised in Table 2) can therefore be used to validate business imperatives as the driving forces behind achieving the strategic objectives of a company.

3.5 IT governance

The evolution of IT has caused major changes in the business models of companies (Osterwalder, 2004:11) and it is becoming increasingly more apparent that IT is critical to the survival of companies in the extremely competitive 21st century business-world. The effectiveness of IT-solutions is however not guaranteed upon implementation and is greatly dependent on well implemented IT governance structures (Wu, Straub & Liang, 2015:498). The ITGI (2003:10) defines IT governance as "the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organisational structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategies and objectives."

IT governance is a subset principle of corporate governance, which is specifically included in the King III report due to the increasingly pervasive implementation of IT in companies (Institute of Directors Southern Africa, 2009:16). As indicated in Table 3, the fifth chapter of King III highlights seven IT governance principles which should be implemented in companies in order to achieve proper governance of IT (Institute of Directors Southern Africa, 2009:82-87).

Table 3: Seven IT Governance principles of King III

Principle number	Description of the principle
Principle 5.1	The board should be responsible for IT governance
Principle 5.2	IT should be aligned with the performance and sustainability objectives of the company
Principle 5.3	The board should delegate to management the responsibility for the implementation of an IT governance framework
Principle 5.4	The board should monitor and evaluate significant IT investments and expenditure
Principle 5.5	IT should form an integral part of the company's risk management
Principle 5.6	The board should ensure that information assets are managed effectively
Principle 5.7	A risk committee and audit committee should assist the board in carrying out its IT responsibilities

(Source: Institute of Directors Southern Africa, 2009:82-87)

According to Butler and Butler (2010:35-36) the following important aspects relating to IT governance are addressed by King III:

- **The objectives of IT governance.** The IT governance focus areas according to the ITGI are included in King III and describe the objectives of IT governance (refer to section 3.5.1 and the mapping performed in Table 4);
- **The party / parties responsible for IT governance** (refer to section 3.5.2); and
- **How IT governance is achieved.** According to principle 5.3 of King III IT governance is achieved by implementing structures, processes and mechanisms in order to execute the relevant IT governance framework (Butler & Butler, 2010:35-36; Institute of Directors Southern Africa, 2009:83).

3.5.1 The focus areas (objectives) of IT governance

The ITGI, an international research organisation that provides guidelines to companies on the implementation of IT governance, named the five focus areas of IT governance as value delivery, strategic alignment, risk management, resource management and performance management (ITGI, 2008:15). These principles are described by the ITGI as follow (ITGI, 2008:32):

- **Value delivery** aims to ensure that IT delivers the expected benefits, in line with the company's strategy, by focusing on optimising costs and extracting maximum value from IT.

  According to the ITGI the principle of value delivery is dependent on the other four focus areas. Value delivery "requires strategic alignment, is enabled by risk management and resource management, and – together with the other areas – is monitored by performance measurement" (ITGI, 2008:15).

- **Strategic alignment** is about ensuring the alignment between business and IT strategies and operations within a company. The focus is on ensuring the required value proposition is realised.

- **Risk management** requires senior management to have an understanding of the risks related to IT, the compliance requirements related to these risks and what the company's risk appetite is. It also requires management to demonstrate transparency regarding the

risks and implementing sufficient risk management policies and procedures within the company.

- **Resource management** focusses on ensuring the optimal investment in IT-related resources and managing these resources effectively. Critical IT resources include infrastructure, applications, information and staff. The management of the core infrastructure and knowledge is of particular importance.

- **Performance measurement** entails the utilisation of measures like the balanced scorecard to monitor the performance of the IT function. This will provide management with achievable, measurable goals, which is easier to measure and therefore manage. Specific elements to monitor and manage accordingly include the implementation of the IT strategy (and its alignment with the business strategy), individual projects, resource management, processing done by the systems and overall service delivery.

The focus areas of IT governance according to the ITGI can be aligned to the IT governance objectives as derived from the seven IT governance principles of King III, as illustrated in Table 4.

Table 4: IT governance principles according to King III mapped to the IT governance principles according to the ITGI

King III		**ITGI**
King III IT governance principle number and description	**Aspect of IT governance addressed by King III, as identified by Butler and Butler (2010:35-36)**	**ITGI IT governance focus area (objective) (ITGI, 2008:32)**
Principle 5.1 The **board should be responsible** for IT governance	• **The party / parties responsible** for IT governance	
Principle 5.2 IT should be **aligned** with the **performance and sustainability objectives** of the company	• The **objectives** of IT governance: - Strategic alignment - Performance management	• Strategic Alignment • Performance management
Principle 5.3 The **board should delegate to management** the responsibility for the **implementation of an IT governance framework**	• **The party / parties responsible** for IT governance • **How** IT governance is achieved	

Principle 5.4 The board should monitor and evaluate significant **IT investments and expenditure**	• The **objectives** of IT governance: - Value delivery	• Value delivery
Principle 5.5 IT should form an integral part of the company's **risk management**	• The **objectives** of IT governance: - Risk management	• Risk management
Principle 5.6 The board should ensure that **information assets are managed** effectively	• The **objectives** of IT governance: - Resource management	• Resource management
Principle 5.7 A **risk committee and audit committee** should assist the board in carrying out its **IT responsibilities**	• **The party / parties responsible** for IT governance	

According to the mapping performed in Table 4 above, the IT governance principles of King III relating to the objectives of IT governance are aligned with the five IT governance focus areas of the ITGI. Adherence to King III will consequently ensure compliance with the ITGI's IT governance focus areas.

3.5.2 The board of directors and executive management's responsibility towards IT governance

According to the IT Governance Institute (2003:10) "IT governance is the responsibility of the board of directors and executive management". According to Butler and Butler (2010:35-36) principle 5.1 of King III states that the board of directors should take ultimate responsibility for IT governance, while King III principles 5.3 and 5.7 advise the board to delegate certain responsibilities to management and the risk- and audit committees (Institute of Directors Southern Africa, 2009:82-83). As IT has evolved at a rapid pace over the past few decades, and is developing faster still, this responsibility has become increasingly more extensive and complicated since the birth of the IT governance concept (Ali & Green, 2012:190; Hardy, 2006:56).

The responsibility of IT governance requires from the board of directors and executive management to provide leadership to the IT function of a company and establish organisational structures and processes which are aligned with the company's strategic

objectives (ITGI, 2003:10). This responsibility calls for the board of directors and senior management to play an active role in the growth and maintenance of its IT function.

Based on an examination of 20 case studies explaining IT-related projects and their objective of improving business performance, Quaadgras, Weill and Ross (2014:114 & 120) concluded that management's commitment to IT-investments are positively correlated with the impact IT has on company, which in turn influences a company's performance. In other words, management's commitment to IT-related projects and investments generates more business value for the company than those projects and investments which lacked commitment from management.

Senior management of most companies understand that IT-enabled investments will yield a higher return on investment than traditional investments (Bowen *et al.*, 2007:192). As a result, more funds are being applied towards IT-related investments in such companies, in order to obtain or maintain a competitive advantage (Bowen *et al.*, 2007:192). Surveys however revealed a low success rate for IT investments (ITGI, 2008:10), which means that companies are not obtaining the required return on their investments. Between 20 and 70 percent of significant IT-enabled investments do not reach their target as a result of technical challenges or failing to deliver the intended value to the company (ITGI, 2008:10).

Iijima (2015:57-58) argues that IT staff in charge of IT projects can be a large contributing factor to the failure of IT projects when IT personnel do not understand and are not incentivised to achieve the business requirements of the project. Conversely, IT specialists are often of the opinion that business leaders are not able to govern the IT function, as they have no technical knowledge of IT (Juiz & Toomey, 2015:60). This sentiment is shared by business leaders who realise that they do not understand IT and is therefore reluctant to be involved in the governance of the IT function (Ross & Weill, 2002:1).

Juiz and Toomey (2015:60) however claim that technical knowledge of access path components and the access path process (i.e. build, setup, configuration, maintenance and operation of the access path components) are not a prerequisite to fully understand the business value IT-enabled investments can deliver. This means that management is in a position to plan the utilisation of improved IT-solutions to obtain company benefits, even without the relevant technical knowledge. Juiz and Toomey (2015:60) therefore argue that business managers should take responsibility for IT governance.

In a Harvard Business Review study conducted, Ross and Weill (2002:1) claimed that IT-related investments which are properly managed generate returns of up to 40 percent more than those of their competitors. This success rate is mainly attributed to executive management making the key decisions related to IT investments. On the contrary, when executive management delegates this responsibility to IT managers, project failure often occurs (Ross & Weill, 2002:1).

It is therefore clear that the realisation of the business value which IT-related investments are expected to produce for a company, increases significantly when senior management of the business and the board of directors become involved in the decision-making process surrounding IT-related investments and ultimately take responsibility for the IT governance function.

3.5.3 Advantages of compliance with good IT governance principles

According to Bin-Abbas and Bakry (2014:261) IT governance assists companies to ensure the effective and efficient use of IT. IT governance is therefore pivotal in extracting maximum value from the IT solutions implemented by a company and consequently increases business value. Juiz and Toomey (2015:59) adds to this statement by arguing that IT governance is essential to ensure that IT-related investments generate the intended value to the company and mitigate risks associated with the IT investment. De Haes and Van Grembergen (2009:135) found that there is a close correlation between the implementation of IT governance processes and achieving alignment between business and IT, while Hardy (2006:57) states that tools such as the IT balanced scorecard, which could be used by the board of directors in order to measure the performance of the IT department, are effective in achieving strategic alignment.

Other than achieving the objectives of IT governance (namely strategic alignment, performance measurement, proper resource management, ensuring value delivery and appropriate risk management addressed in section 3.5.1.), the effective implementation of IT governance will yield the following additional benefits for companies (Wilkin & Chenhall, 2010:108; Bowen *et al*. 2007:192):

- Improved efficiencies in the operations of companies and tangible business benefits, such as reduced operational costs and improved product development, which will ultimately lead to meeting stakeholder expectations more effectively;
- Increased confidence towards and trust in the company;
- An improved reputation of the company; and

- Creating a competitive advantage for the company.

3.5.4 Risk of not complying with good IT governance principles

According to the introduction and background section of the King III report, the complexity of IT systems and the pervasive use of IT creates a number of risks to companies (Institute of Directors Southern Africa, 2009:16). In addition to not achieving the IT governance focus areas provided by the ITGI and the King III IT governance principles, the introduction and background section of King III highlights the following risks that could occur when ubiquitous implementation of IT takes place and it is not governed adequately (Institute of Directors Southern Africa, 2009:16):

- Operational risks occur. King III provides an example of the risk of unauthorised disclosures of confidential information to unauthorised parties which may occur due to unauthorised use of or access to the system, especially when the IT function is being outsourced.
- The risk that the IT system loses its integrity or that the integrity of information processed by the system cannot be guaranteed.
- A risk that the IT system becomes unavailable, unusable, is not useful to the users or that disruptions or changes to the information system occur.

3.6 IT architecture defined

IT governance principle 5.2 of King III requires IT to support a company's strategic objectives (Institute of Directors Southern Africa, 2009:83). According to Boshoff (2014) this alignment should be achieved by designing a company's IT architecture in such a way that IT supports the business imperatives, and ultimately the strategic objectives, of the company.

IT architecture has been defined by various institutions. The Clinger Cohen Act (United States of America, 1996), a United States federal law aimed at regulating the way in which IT is acquired, used and disposed of in federal government, defines IT architecture as "a framework for evolving or maintaining existing information technology and acquiring new information technology to achieve the agency's strategic goals and information resources management goals".

The International Organization Of Standardization (2011) defines architecture as follows in the ISO/IEC/IEEE 42010 standard:

> "(System) fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution."

The International Organization Of Standardization (2011) defines the term architecting as follow in the ISO/IEC/IEEE 42010 standard:

> "Process of conceiving, defining, expressing, documenting, communicating, certifying proper implementation of, maintaining and improving an architecture throughout a system's life cycle."

The Open Group (2011)'s Architectural Framework (TOGAF) defines architecture in two ways, depending on the context:

1) "A formal description of a system, or a detailed plan of the system at component level, to guide its implementation"; and
2) "The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time".

Zachman (2015), the creator of the Zachman model for enterprise architecture, defines architecture as:

> "A set of descriptive representations that are relevant for describing something you intend to create and that constitute the baseline for changing an instance of that thing once you have created it. Therefore, enterprise architecture is the set of descriptive representations relevant for describing an enterprise and that constitutes the baseline for changing the enterprise once it is created."

ISACA (n.d.) defines IT architecture as a "description of the fundamental underlying design of the IT components of the business, the relationships among them, and the manner in which they support the enterprise's objectives".

According to Op't Land, Proper, Waage, Cloo and Steghuis (2009:35) enterprise architecture has several focus points. They explain that "in an IT view, one would define and describe the structure and relationships of IT systems including the way IT supports the enterprise to achieve its business goals".

Op't Land *et al.* (2009:40) argue that all of the elements of enterprise architecture, of which IT architecture is one, are a means to an end and that IT architecture can be used, amongst other things, for strategic business/IT planning, to align IT with the strategic objectives of a

company, to define and guide IT and/or business alterations and to define and monitor IT programs. This is echoed by Boshoff (2014), who explains that IT architecture directs the specific IT components that will be selected within the planned architecture in order to align IT with the enterprise's business imperatives.

Boshoff (2014) describes IT architecture as the theoretical design of the IT components (including data, applications and infrastructure) and the interrelationship between these components. It comprises of the enterprise's application decisions, including planning for the integration of the chosen applications, and the technical IT infrastructure needed to meet the requirements of the chosen applications. On this basis Boshoff (2014) classified IT architecture into two broad categories, namely the "application plan" or "master systems plan" and the "infrastructure architecture". The application plan represents the high-level IT architecture a company requires in order to meets its objectives (Boshoff, 2014). Infrastructure architecture, on the other hand, is the more detailed layer of IT architecture and represents the conceptual design according to which the access paths can be designed (Boshoff, 2014). The "application integration plan" represent the tools used to integrate the application plan and the infrastructure architecture (Boshoff, 2014). According to Gartner (n.d.) data integration refers to "the practices, architectural techniques and tools for achieving the consistent access and delivery of data across the spectrum of data subject areas and data structure types in the enterprise to meet the data consumption requirements of all applications and business processes", which echoes Boshoff's (2014) description of the application integration plan.

Using these perspectives, IT architecture is defined, for the purpose of this study, as the conceptual design of IT components, including the interrelationship between these components, and the principles and guidelines governing the design, which should be maintained and evolved in order to achieve a company's IT goals and, ultimately, the strategic goals of the company. The categories used by Boshoff (2014), namely "application plan", "infrastructure architecture" and "application integration plan" will be used in this study. These concepts are defined and explained in the remainder of this section.

The application plan (master systems plan):

Information systems form part of the application plan layer of IT architecture (Boshoff, 2014). An information system is defined by ISACA (n.d.) as "the combination of strategic, managerial and operational activities involved in gathering, processing, storing, distributing and using information and its related technologies". The application plan, and the underlying information system, consist of the following:

- **Application architecture**, which includes *inter alia* general applications, specialised applications and workflow (Boshoff, 2014), and represents the routing and integration of tasks between various software applications and hardware systems (Gartner, n.d.). According to Aerts, Goossenaerts, Hammer and Wortmann (2004:788) application architecture has become distributed in the web-enabled era, consisting of interoperable components;
- **Hardware**, defined as "the physical components of a computer system" by ISACA (n.d.) **and software**, which, according to ISACA (n.d.), "controls the operation of the hardware and the processing of data". Aerts *et al.* (2004:788) state that a vast amount of peripheral devices, including powerful personal computers, have increased mobility in the web-enables era;
- **Office automation** which is enabled by networks of hardware, software and processes employed in a company and represents the automation of communication and information processing tasks previously performed manually (Encyclopedia.com, n.d.); and
- **Data and information**: Any services relating to the aggregation, processing, storage and output of data and information are included in this category (Boshoff, 2014). Data warehousing, which allows for the aggregation of data from internal and external sources in order to analyse the data to support business decisions (Encyclopedia.com, n.d.), is also included in this category. One of the focus areas of an integrated architecture framework developed by Capgemini, as cited by Op't Land *et al.* (2009:68), is called the information aspect, which highlights the importance of information as part of IT architecture.

Infrastructure architecture refers to, *inter alia*, the following:

- **Information processing** which refers to the manipulation of data by IT equipment such as computers, to produce useful information (Encyclopedia.com, n.d.);
- **Network infrastructure:** A network refers to "any number of computers (e.g., PCs and servers) and devices (e.g., printers and modems) joined together by a physical communications link" (Gartner, n.d.). Network infrastructure delivers the communication services and paths between various processes, applications, users, services, external networks and the internet (Techopedia, n.d.). Aerts *et al.* (2004:788) state that low cost communications and high bandwidth networks introduced in the web-enabled era enable new forms of communication and opportunities for collaboration. In addition to enhancing communication internal to a company as well as business-to-business communication, it also supports a global communication

infrastructure which allows for the introduction of new relationships in the market and drive the development of new collaborative technologies (Aerts *et al.*, 2004:788); and

- **Integration** between various applications, between applications and other components of the access paths as well as external systems (Boshoff, 2014).

3.7 COBIT control framework

3.7.1 COBIT control framework defined

Due to the pervasive implementation of IT in companies and the important role it plays in achieving companies' strategic objectives, the governance of IT is becoming increasingly important. IT governance principle 5.3 of King III specifically requires the implementation of an IT governance framework to assist with the governance of IT (Institute of Directors Southern Africa, 2009:83).

According to ISACA (n.d.) COBIT, issued by ISACA (previously known as the Information Systems Audit and Control Association, ISACA now goes by its acronym only) and currently in its fifth edition, is "the leading framework for the governance and management of enterprise IT" and it provides companies with guidance to support its business requirements (COBIT, as referenced by Bin-Abbas & Bakry, 2014:262). COBIT is one of the most comprehensive IT governance frameworks available and King III makes specific reference to COBIT, stating that this particular framework could be used to assess and implement IT governance within an entity (Institute of Directors Southern Africa, 2009:16). According to a survey conducted by ISACA and Protiviti (2015:21), which was completed by 1,230 respondents globally, including executives and professionals, COBIT was identified as the framework most companies make use of for, amongst other things, their IT risk assessment.

COBIT 5 provides "a comprehensive framework that assists enterprises in achieving their objectives for the governance and management of enterprise IT. Simply stated, it helps enterprises create optimal value from IT by maintaining a balance between realising benefits and optimising risk levels and resource use" (ISACA, 2012:13). This statement is supported by the findings of a study done by Steenkamp (2011:7), being that the implementation of COBIT will assist companies in achieving the seven IT governance principles required by King III, and consequently the IT governance objectives according to the ITGI (refer to section 3.5.1.).

Thus, COBIT is a good-practice framework for IT governance (De Haes, Van Grembergen & Debreceny, 2013:307) which can assist companies to manage their IT operations on a day-to-day basis and henceforth reduce the IT gap (Steenkamp, 2011:6).

According to Steenkamp (2011:4-5) and Butler and Butler (2010:43), the IT governance requirements according to King III mirrors the five focus areas of IT governance which, according to the ITGI (2008:15), are value delivery, strategic alignment, risk management, resource management and performance management. King III however does not provide detailed guidance on how to implement IT governance, what IT governance entails and the parties responsible for various aspects of IT governance (Muller, 2009). Steenkamp (2011:7) concluded that the IT governance requirements according to King III are indeed addressed by COBIT and this framework can consequently be used to ensure compliance with King III. Hardy (2006:59-60) supports this statement by arguing that the COBIT framework is the number one control framework for achieving compliance with IT governance principles as it provides companies with a rigorous approach to implement these principles. Hardy (2006:59-60) also found that the COBIT framework does indeed assist companies in maximising the benefits of information and exploiting business IT-related opportunities while reducing the risks related to these opportunities. This statement is in turn supported by Morales (2014), who found that COBIT 5 assists companies in achieving their goals and add value to their company.

The findings above can be summarised by the statement made by Rudman (2008), that the implementation of COBIT assists companies in achieving IT governance and it provides a framework for quality management and alignment of business and IT objectives within a company.

3.7.2 The relevance of the COBIT control framework to the framework

The objective of this study is to validate the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap by designing IT architecture, as well as the access path components and access path processes, which will support the successful execution of the business imperatives of a particular company in order to ultimately achieve alignment between business and IT on a component level. The validated business imperatives will in turn form the basis of the framework that is developed in this study, and which provides guidance on designing IT architecture in alignment with the business imperatives of the company.

As depicted in Appendix II, COBIT 5 identifies 37 enabling processes, categorised into five domains, designed to meet the principles for the management and governance of IT. Five of these processes relate to the governance domain named “Evaluate, direct and monitor”, which defines the role of the board of directors in evaluating, directing and monitoring IT governance in a company. The remaining 32 enabling processes are categorised under the four domains relating to the management of IT. These four domains describe how management fulfils the governance objectives of the company while:

- Aligning, planning and organising;
- Building, acquiring and implementing;
- Delivering, servicing and supporting;
- Monitoring, evaluating and assessing (De Haes & Smalley, 2015).

More detailed guidance on the implementation of the enabling processes is provided by the 68 governance practices of COBIT 5. While the enabling processes describe the purpose of the relevant process, the underlying governance practices provide users with detailed guidance on how the enabling process can be achieved.

COBIT 5 plays a critical role in aligning business and IT objectives and it provides companies with a rigorous approach to reach the IT governance principles as defined by King III (De Haes *et al.*, 2013:308). Both the purpose statements and the governance practices in COBIT 5 highlight the purpose of the relevant enabling processes in describing the goals which will be achieved when implementing the enabling processes and their underlying governance practices. The purpose of each enabling process therefore contributes to achieving the IT governance principles as defined by King III. The purpose of the enabling processes extracted from both the process purpose statement and governance practices can therefore be aligned with the business imperatives identified for the purpose of this study. This will contribute towards validating the hypothesis that business imperatives should act as the basis to bridge the IT gap (by designing IT architecture in alignment with business imperatives) in order to achieve the IT governance principles as defined by King III.

3.8 The IT Gap defined

IT governance principle 5.2 of King III requires alignment between IT and the performance and sustainability objectives of the company (Institute of Directors Southern Africa, 2009:83). Senior management is responsible for defining the business objectives as well as the design

and implementation of the structures, processes and mechanisms to address IT governance (Institute of Directors Southern Africa, 2009:83). According to Rudman (2011:37) these structures, processes and mechanisms include control frameworks and control models. This statement is aligned with principle 5.3 of the King III report, which states that "the board should delegate to management the responsibility for the implementation of an IT governance framework" (Institute of Directors Southern Africa, 2009:83).

On the other end of the spectrum IT specialists are responsible for the implementation of IT solutions and control techniques on a component level, in order to achieve the IT governance objectives set by senior management (Rudman, 2011:37). Control techniques need to be linked to the relevant control frameworks and models and should be determined by the business context of the company in order for these control techniques to reach their desired outcomes.

In many cases senior management does however not have knowledge of IT or control techniques and the IT specialists do not understand the objectives of the company, its business model or the business processes implemented (Rudman, 2011:37). Miscommunication often occur between business and IT professionals as a result of IT specialists' lack of understanding of the business objectives and the importance of IT governance and senior management's lack of understanding of IT (Rudman 2011:37; Osterwalder 2004:16), causing misalignment between business and IT within a company, otherwise referred to as the "IT gap".

3.9 Business-IT Alignment

3.9.1 Business-IT alignment defined

Strategic alignment, i.e. the alignment between business and IT objectives, is one of the focus areas of IT governance (ITGI, 2008:31) and can be seen as the key to the achievement of IT governance (Wilkin & Chenhall, 2010:107; ITGI, 2003:22). In contrast with the IT gap, business-IT alignment involves the alignment between IT strategies and business objectives, in the context of the business model of the company. This alignment enables a company to extract the desired value from their IT-related investments (Juiz, Gómez & Barceló, 2012:70; Wilkin & Chenhall, 2010:113). The ITGI (2003:22) claims that business-IT alignment cannot

be separated from the mere concept of IT strategy as it needs to support the overall strategy of the company.

De Haes and Van Grembergen (2009:123-124) noted that many companies are implementing various IT governance structures, processes and relational mechanism on an operational level, which addresses one or more aspects of business-IT alignment in isolation. De Haes and Van Grembergen (2009:123-124) argue that a holistic approach is required to fully understand the complexities relating to strategic alignment.

Wilkin and Chenhall (2010) established a survey-based taxonomy of IT governance, which concluded that strategic alignment is of critical importance in the ultimate achievement of IT governance objectives. This conclusion is based on a positive correlation between effective IT governance and a shared understanding of business and IT objectives between business leaders and IT specialists (Wilkin & Chenhall, 2010:134). Bowen *et al.* (2007:202) echo this positive correlation between the effectiveness of IT governance and the shared understanding of IT and business objectives by the parties involved in an in-depth study of one particular company.

In order to achieve business-IT alignment, companies should consider both how IT influences its business model (Osterwalder, 2004:5-6) and how the business model influences the IT-related decisions made by the company (De Haes & Van Grembergen, 2009:124). The first aspect of business-IT alignment should be addressed when designing the business model of the company, which can be achieved by utilising Osterwalder's (2004:5-6) business model canvas for instance, which contains guidelines on how to reinvent a company's business model to utilise ever-changing IT solutions. The evolution of IT changes the business landscape and, in some business sectors, it even influences the nature of products and services (Kalkan, Erdil & Çetinkaya, 2011:859). It is therefore vital for the survival of companies to take both the disruptions and possibilities of technological advancements into account when designing their business model. What really matters in achieving business-IT alignment in a company, however, is that the IT solutions implemented support and give effect to a company's business model and ultimately its strategic objectives. As Kark, White and Briggs (2015:14) state, Chief Information Officers (CIO's) need to focus more on the business solutions and the potential value technologies can deliver and take the focus off the emerging of the technologies itself.

It can therefore be concluded that in order to achieve business-IT alignment, the business objectives of a company need to be converted into objectives for the IT department. These objectives should then form the basis of the IT strategy in order for the IT strategy to be successfully aligned with the business strategy (Wu *et al.*, 2015:504). This should be done first and foremost by aligning the business model of a company with its IT architecture (Boshoff, 2014).

3.9.2 Advantages of business-IT alignment

According to the ITGI (2003:22) the crux of IT governance is determining whether a company's IT investment is in accordance with their strategic objectives (intent, current strategy and company goals), which will provide the abilities needed to deliver business value. The successful alignment between business and IT strategies and operations will ensure that the IT function will support the company in reaching its overall strategies and business goals (Innotas, 2010:9; ITGI, 2008:15). In addition to the strategic alignment focus area of the ITGI being successfully reached, the alignment between business and IT strategies also contributes to compliance with the ITGI's other four IT governance focus areas in the following ways:

- **Value delivery:** Strategic alignment will ensure that IT investments deliver the intended value to the company (ITGI, 2003:22).
- **Risk management:** Business-IT alignment will ensure the reduction of business and IT related risks (Innotas, 2010:9).
- **Resource management:** Business-IT alignment will ensure the optimal investment in IT-related resources, i.e. IT-related investments which will support the company in reaching its overall strategies and business goals (Innotas, 2010:9; ITGI, 2008:15). Furthermore, business-IT alignment will ensure the most effective use of IT resources, which will save costs and reduce overheads, ensuring maximum return on investment (Innotas, 2010:9).
- **Performance measurement:** One of the elements the ITGI requires to be monitored, and managed accordingly, is the implementation of an IT strategy and its alignment with the business strategy (ITGI, 2008:31). Monitoring strategic alignment against a measurable framework will enable performance management of strategic alignment as an IT governance objective.

In addition to compliance with the ITGI's IT governance focus areas, the successful alignment between business and IT strategies and operations will ensure:

- Transparency between the IT department and business leaders regarding IT expenditure and the utilisation, capacity and availability of IT resources, including their output. This will enable business leaders to make better decisions based on valid, accurate and complete information obtained in real-time (Innotas, 2010:9);
- Trust of internal (for example employees) and external (for example investors, customers and suppliers) parties is enhanced and the reputation of the company is consequently improved (Penning *et al.*, 2014:138);
- The consolidation of enterprise platforms and architecture (Innotas, 2010:9);
- The realisation of business value as well as more effective and efficient business processes, which will provide the company with a competitive advantage (Wu *et al.*, 2015:498; Penning *et al.*, 2014:138);
- A better understanding of IT amongst the senior management of business, which will result in improved decision-making processes, based on more timely and better quality information (Penning *et al*., 2014:138); and
- An improved level of compliance with laws and regulations (Penning *et al.*, 2014:138).

3.9.3 Consequences of misalignment between business and IT

According to Smit (2009:29) the consequences of misalignment between business and IT stretch far beyond merely losing out on the benefits of alignment. Every aspect of the company will be influenced negatively by the lack of business-IT alignment.

When business-IT alignment is not achieved, the company may experience the following risks, in addition to forfeiting the advantages of business-IT alignment:

- Due to a lack of support from the IT department, the company does not meet its strategic objectives, which could lead to financial losses, business interruptions, customer dissatisfaction and a lack of trust (Ali & Green, 2012:179; Bakari, Tarimo, Yngström, Magnusson & Kowalski, 2007:45);
- Inadequate IT controls can lead to inaccurate and incomplete processing and reporting of information, which in turn will lead to poor decision-making by business leaders (Ali & Green, 2012:179; Smit, 2009:30);
- The breaching of relevant laws and regulations may lead to legal action against the company (Bakari *et al.*, 2007:46); and
- It can even lead to complete failure of the IT department and even the company itself (Ali & Green, 2012:179).

3.10 The relevance of a framework and the role it plays in achieving business-IT alignment

The purpose of this study is to develop a framework to provide senior management of a company with practical guidance to bridge the IT gap by identifying the business imperatives relevant to the company and determining the impact of these business imperatives on the company's IT architecture.

For the purpose of this study a list of business imperatives, which is validated with reference to the business model canvas and COBIT 5, form the basis of the framework. The business imperatives contained in the framework could be of assistance to companies in a wide variety of industries and will therefore allow senior management to identify the business imperatives most applicable to their company, in alignment with their specific strategic goals. Each company should have a maximum of five to seven business imperatives (Boshoff, 2014).

After identification of the business imperatives relevant to the company, the framework provides a company with guidance to determine the business requirements and ultimately its impact on the IT architecture of the company, in order to give effect to their business imperatives. Guidance of the impact on the IT architecture of a company will be provided in order to enable a company to determine their various access path components and the process surrounding each component (i.e. the build, setup, configuration, operating and maintenance of each component).

3.11 Historic review of prior research

3.11.1 The IT gap, achieving alignment between business and IT objectives and business imperatives

Miscommunication often occurs between senior business managers and IT specialists in companies, resulting in the IT gap (Goosen & Rudman, 2013:94). Companies are required to integrate their IT strategies with their overall business strategies and business processes (IT governance principle 5.2 in King III), which will lead to bridging the IT gap. In order to achieve business-IT alignment Boshoff (2014) uses the hypothesis that business imperatives act as the drivers of a company, and should be used as the basis to bridge the IT gap, by designing IT architecture which will support the successful execution of the business imperatives of a particular company.

From the literature review, it was found that research has been done on bridging the IT gap on various levels. Initial research was focussed on gaining an understanding of the IT gap and developing high-level approaches to bridge the IT gap. Smit (2009:50) designed a model to reduce the IT gap by aligning business imperatives with IT governance objectives and the aforementioned IT governance objectives with IT operations on a high level. Goosen and Rudman (2013:100) developed a framework combining a best practice control framework (COBIT 4), a generally accepted control model (ITIL) and internationally accepted standards (ISO 27001 and ISO 27002), linked to generic business imperatives. This framework can be used to implement IT governance principles on a strategic level. Botha (2014:74) developed a step-by-step approach to implement IT governance principles in a medium sized enterprise in South Africa, thereby bridging the IT gap in this particular environment.

Although generic lists of business imperatives were produced and mapped to the COBIT framework by both Smit (2009:7-12 & 31) and Goosen and Rudman (2013:97-98), the hypothesis that business imperatives serve as drivers of a company that should be governed, and can be used as the starting point for bridging the IT gap, has not been validated. In addition, guidance on the impact of business imperatives on the IT architecture of a company has also not yet been developed.

3.11.2 The role of business models in aligning business and IT objectives

From the literature review relating to business models it is clear that extensive research has been conducted to determine the impact that rapidly evolving IT and the internet has on business models. In his doctoral thesis Osterwalder (2004:18-19) claims that new business models have developed as a result of technological change. Osterwalder also expects this evolution of business models to remain in effect as technology continues to develop and influence the business environment. Osterwalder and Pigneur (2005:6-7) were pioneers in defining the concept of the business model and concluded that a close correlation exists between the prominence of the concept of business models and the introduction of the internet into the business sphere towards the late 1990's. According to Osterwalder and Pigneur (2005:8) "business design choices for managers increased substantially based on cheap and available information technology. This decrease in costs led to industry boundaries becoming increasingly blurred."

In a special issue dedicated to the topic of business models, Chesbrough (2010:362) explores the correlation between business innovation and the need for business models, stating that

business models assist companies to “commercialise new ideas and technologies” (Chesbrough, 2010:354). Teece (2010:173) analysed the importance of business models and studied its connection with business strategy, economic theory and innovation management. In his study Teece (2010:173) states that, in order to benefit from innovation, attention needs to be paid to business model design and the impact of, amongst other factors, evolving technology on the design of business models. During subsequent research conducted, Osterwalder and Pigneur (2013:238) remarked that IT can assist researchers in the strategic management field to investigate the process of generating business models.

In order to achieve business-IT alignment, companies should however consider both how IT influences its business model and how the business model influences the IT-related decisions made in the company (De Haes & Van Grembergen, 2009:124). A gap in research has been identified relating to the impact of business models on the IT solutions implemented and IT control environments created by companies.

3.11.3 Summary of prior research

From the literature review conducted it appears that various gaps in research regarding business-IT alignment, and in particular the role of business models in achieving business-IT alignment, still exists. Firstly, studies relating to business models, and the role it plays in achieving alignment, have focussed on determining the impact of IT on business models and designing business models accordingly. Secondly, with reference to the alignment of IT objectives with business objectives, the concept of business imperatives has been used by researchers as a starting point to achieve alignment with IT architecture. Business imperatives have also been aligned with IT governance objectives, IT operations and control frameworks, -models and -standards.

This study proposes to address the gap in research by aligning a company’s IT objectives with its business objectives and business model. The hypothesis that business imperatives serve as drivers of a company which should be governed, and can be used as the starting point for bridging the IT gap, will be validated and the impact of business imperatives on IT architecture will be determined.

Ultimately, this study proposes to address the lack of guidance provided to companies relating to the alignment of IT with business objectives upon implementation of IT solutions. This

guidance will focus on reducing the IT gap by aligning the company's business imperatives, which are determined by its business model, with its IT architecture.

CHAPTER 4: FINDINGS ON THE IMPLEMENTATION OF IT IN ALIGNMENT WITH BUSINESS OBJECTIVES

As depicted in Figure 3, the following process needs to be followed by a company to achieve alignment between business and IT at a strategic level:

- **Step 1:** A company needs to determine its own unique **business imperatives**, which act as the drivers of a company and are critical to give effect to in order for the company to obtain and maintain a competitive advantage. The business strategy of a company will be determined by taking the business imperatives into account, together with the basic business assumptions of a company, which represents the basic business objectives. The basic business objectives are not unique to a specific company.

  According to the hypothesis used by Boshoff (2014) business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap, by designing IT architecture which will support the successful execution of the business imperatives of a particular company. This hypothesis is validated in section 4.1 of this study by aligning business imperatives to both the business model canvas as well as COBIT 5.

- **Step 2:** In order for the IT division of a company to give effect to its business imperatives, the company needs to determine the requirements of the business (**business requirements**) needed to give effect to the business imperatives.

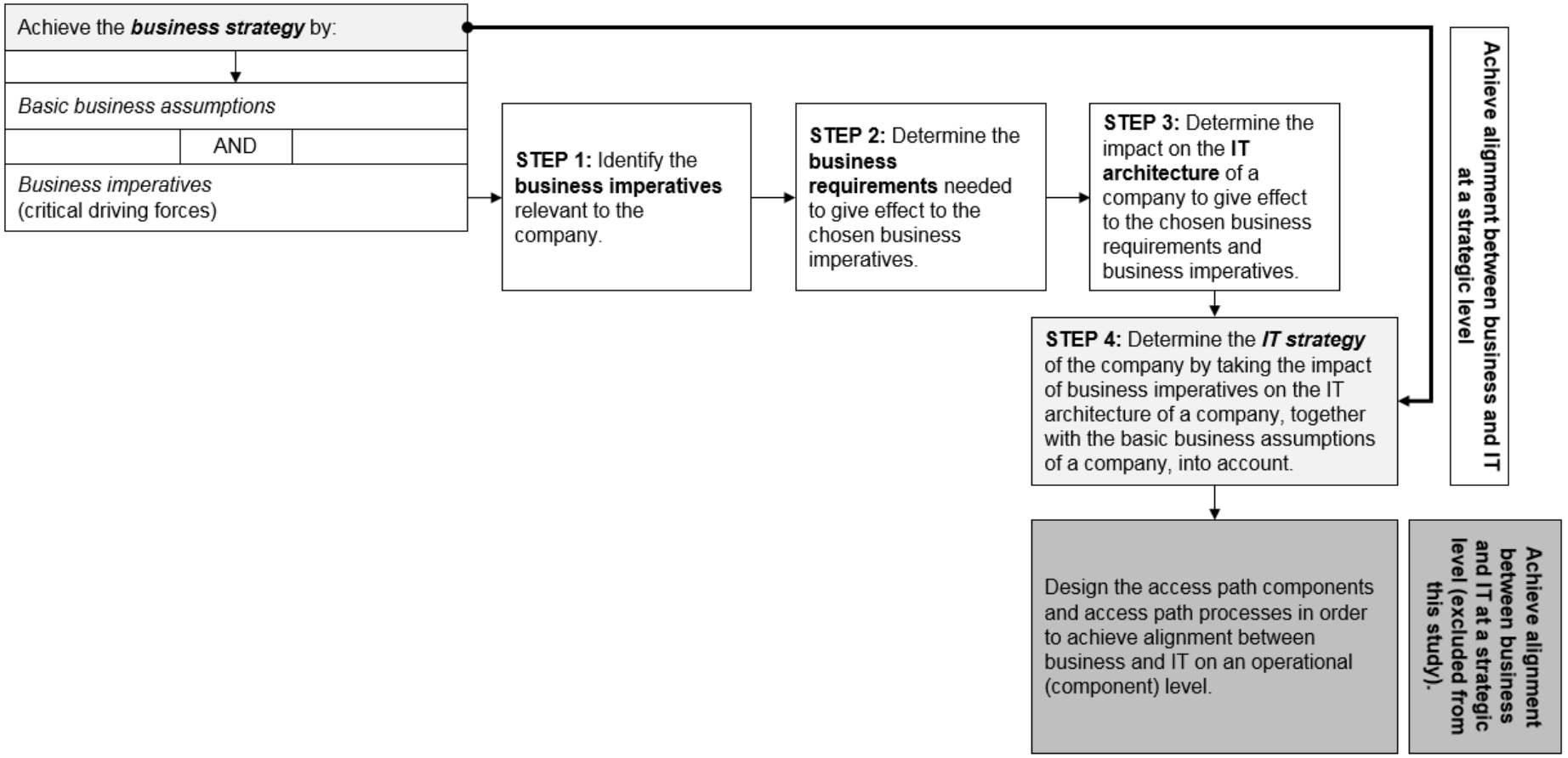
- **Step 3:** The **IT architecture** should be designed with the purpose of supporting the aforementioned business requirements, thereby giving effect to the business imperatives of the company. Refer to section 4.2 for guidance on determining the impact on the IT architecture of a company.

- **Step 4:** Once the impact of a company's business imperatives on its IT architecture is determined, the basic business assumptions should be taken into account to formulate the **IT strategy** of a company. This process will ensure strategic alignment between business and IT objectives, as required by principle 5.2 of the King III report.

In order to achieve alignment at an operational level, the IT department should use the IT architecture and IT strategy determined above to design the access paths of a company, including its components and the access path process.

Figure 3 represents the process which should be followed by senior management of a company to achieve alignment between business imperatives and the IT architecture of the company.

Figure 3: The process of achieving business-IT alignment on a strategic level



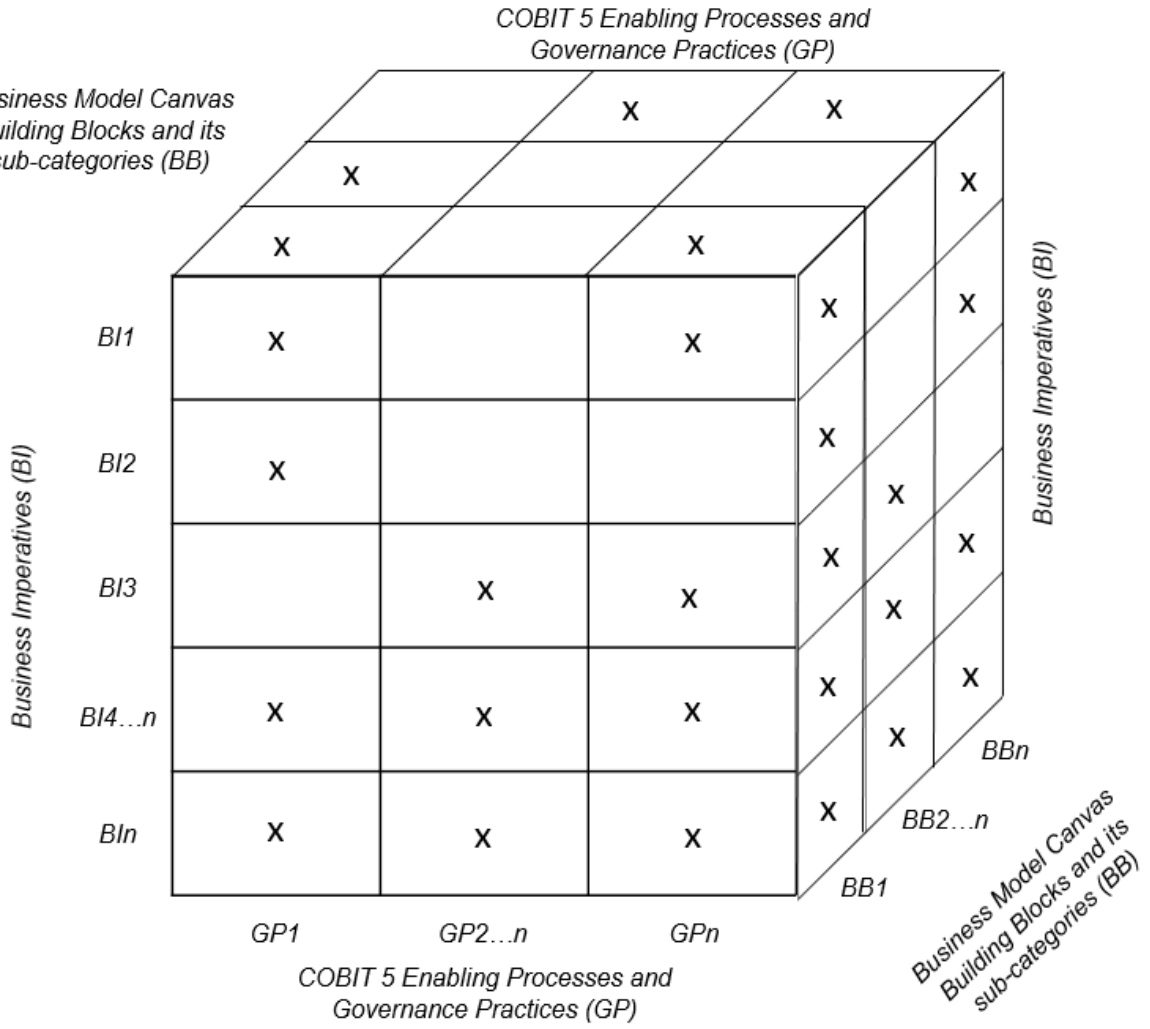
4.1 Validating the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap

The first step in validating the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap, is to compile a list of business imperatives (refer to Step 1 of the research methodology in section 2.2). The business imperatives identified in this study need to be aligned with the nine building blocks of the business model canvas as well as its sub-categories to validate the hypothesis that business imperatives act as drivers of the company and will assist the company in achieving its business objectives (refer to Steps 2, 3 and 4 of the research methodology in section 2.2).

The next step is to align the business imperatives to the enabling processes and the underlying governance practices of COBIT 5 (refer to Steps 2, 3 and 4 of the research methodology in section 2.2). Even though COBIT 5 is a framework representing IT controls, the enabling processes and underlying governance practices explain how COBIT 5 supports the broader objectives of a company. COBIT 5 highlights certain business objectives which should be supported by IT in such a way that the company ultimately extracts maximum value from IT in the most cost effective manner, while the enabling processes and underlying governance practices provide guidance on how these objectives can be achieved. These objectives need to be identified and aligned with the identified business imperatives in order to validate the hypotheses that business imperatives should be used as the basis of aligning the IT strategy with the greater business objectives of a company.

As illustrated in Figure 4 below, areas of overlap need to be identified to ultimately identify business imperatives which can be validated as the drivers of a company and should be used as the basis to bridge the IT gap (refer to Step 5 of the research methodology in section 2.2). IT architecture which will support the successful execution of the business imperatives of a particular company can then be designed in order to ultimately achieve alignment between business and IT on an operational level (refer to Steps 6, 7, 8 and 9 of the research methodology in section 2.2).

Figure 4: Business imperatives which are successfully aligned with both the business model canvas and COBIT 5



(Source: Author's own construct)

4.1.1 Identifying the company's business imperatives

This study has identified 38 business imperatives that may be relevant to particular companies. These business imperatives will be used to validate the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap by designing IT architecture that will support the successful execution of the business imperatives of a particular company in order to ultimately achieve alignment between business and IT on a component level. These business imperatives (BI1 – BI38) are discussed in the remainder of this section.

- **Regulatory compliance (BI1):**

  Although compliance with the laws and regulations which are relevant to all companies is a basic business assumption, the need to comply with industry specific laws and regulations may be a driver of the company (Boshoff, 2014). In demonstrating this point, Goosen and Rudman (2013:97) use the example of the Protection of Personal Information Act, and the protection of sensitive information of customers, as being of particular importance in highly regulated industries such as the financial services sector. Similarly, the protection of sensitive information in national security departments and governmental institutions is of critical importance to achieve the strategic objective of these institutions.

- **High profitability through lower cost (BI2):**

  Obtaining high profitability by keeping costs as low as possible, without compromising the quality of the product or service, is critical to the success of certain companies (Boshoff, 2014). Being cost efficient and keeping costs to a minimum will give companies a sturdy competitive advantage (Drury, 2015:13). According to Drury (2015:576) companies need to focus on customer satisfaction in order to gain or maintain a competitive advantage and one of the customer demands becoming increasingly more noticeable relates to lower costs. For companies operating in industries in which the selling prices of products are highly regulated or competitive, such as fast moving consumer goods (FMCG) retail stores for instance, the profitability of the company is dependent on maintaining low costs, especially regarding fixed costs (i.e. costs which do not vary with the volume of products or services delivered). Low cost is, however, a business imperative for companies in various industries.

  Kark *et al.* (2015) conducted a survey called the 2015 global CIO survey on behalf of Deloitte. 1,271 individuals across 43 countries, covering a wide variety of industries including, *inter alia*, financial services, construction and manufacturing, energy and resources, government and public sector, health care services, consumer business and retail participated in this survey. 45% of the participants of this survey indicated that the reduction of operational and/or product costs is one of their company's top three priorities (Kark *et al.*, 2015:53).

  According to Drury (2015:569) value adding activities should be distinguished from non-value adding activities in order to reduce costs relating to activities which add no value to customers, and for which the customers are not willing to pay, for example inspection costs, storage costs or costs to move raw materials and finished products.

Value adding activities are defined as activities which add to the usefulness of the product, activities performed as effectively as possible or activities which support the primary objective of the product (Drury, 2015:569). Small companies have to be particularly sensitive to costs in order to ensure profitability (Boshoff, 2014).

- **High profitability through added value (BI3):**
  Certain companies obtain higher profitability by delivering products or services of a more superior quality than its competitors. These companies do not aim to achieve profit margins by cutting costs, but rather by increased selling prices in return for exclusive products or services of superior quality (Boshoff, 2014).
- **Affordability (BI4):**
  Low cost products remain popular amongst customers (Goosen & Rudman, 2013:97). Therefore delivering products or services of a similar value at a lower price to customers can ensure a competitive advantage for the company (Boshoff, 2014). Affordability will be of particular importance to companies in the manufacturing industry as it is imperative to manufacture goods in the most cost effective manner, without compromising the quality, in order for products to be affordable to customers and thereby maintain a competitive advantage.
- **Diverse products or lines of business (BI5):**
  Certain companies are dependent on various income streams in order to remain profitable. Examples of such companies are those providing seasonal products or services and companies providing a product at a minimal cost or no profit, while providing additional complimentary products or services which are more profitable. According to the 2015 global CIO survey conducted by Kark *et al.* (2015) 44% of its participants indicated that expansion into new markets, segments and geographies is one of their company's top three priorities (Kark *et al.*, 2015:53).
- **Reliability and quality of products and services (BI6):**
  According to Drury (2015:576) customer satisfaction needs to be a top priority for companies in order to remain relevant and successful. Quality and reliability of products and services has become a key competitive factor as this forms part of customers' ever increasing demands (Drury, 2015:13 & 576). Companies depend on the consistent reliability of their products or services to remain profitable. This includes on-time delivery of services and products if delivery is the responsibility of the company (Drury, 2015:14). According to Drury (2015:576) various studies have found that cost of quality can range between 10 and 20 percent of total sales, which represents a considerable portion of sales. Consequently quality management and improvement will lead to significant cost savings and ultimately increased profitability (Drury, 2015:576).

- **Reliability of information (BI7):**

  Certain companies rely on up-to-date and, in certain cases, real-time information to assist in its decision making processes and operations. Investment companies, for example, cannot afford to base their investment decisions on outdated information, while online retailers need to update the availability of inventory items in order to adequately manage customers' expectations (Boshoff, 2014).

- **Proactive management (BI8):**

  In order to gain and maintain a competitive advantage some companies are forced to be proactive in their strategic decision making and the management of their operations. Companies involved in technological development, for instance, have to be proactive in developing new products and services before their competitors, while retailers have to gain information about their customers in order to meet their needs in a more timely and effective manner than their competitors (Boshoff, 2014).

- **Productivity and efficiency (BI9):**

  In order to optimise the value chain, and ultimately meet customers' needs and gain a competitive advantage, manufacturing companies, for example, have to manage their operations in a productive and efficient manner (Goosen & Rudman, 2013:98). Improved productivity and efficiency will lead to optimal utilisation of resources, which will lead to improved cost management and improved customer satisfaction.

- **Distributed branches (BI10):**

  A fundamental principle to certain companies' operations is having multiple branches in order to reach a wider customer base, possibly distributed over a wide geographical area. This is applicable to retail outlets, for example (Boshoff, 2014). 44% of the participants of the 2015 global CIO survey conducted by Kark *et al.* (2015) indicated that expansion into new markets, segments and geographies is one of their company's top three priorities.

- **Distributed processes (BI11):**

  Large scale operations consisting of multiple locations, such as production plants and warehouses, are an integral part of certain companies' operations. Similar processes will be implemented at the various locations, which could possibly be distributed over a wide geographical area (Boshoff, 2014).

- **Distributed / hybrid project teams (BI12):**

  Certain industries necessitate team members involved in the same project to work from different locations (Boshoff, 2014). Hybrid project teams are teams of which the team members work towards a common goal and work mostly virtually and only communicate in person occasionally (Bard, 2015:5-6). In a survey conducted by EY

(n.d.), 65% of the respondents stated that the extent to which teams are meetings virtually have increased in comparison to traditional face-to-face meetings over the three years prior to the survey. Virtual teams can work from various locations which enable members of such a team to be available 24/7 (Bard, 2015:5). Knowledge sharing (Boshoff, 2014), communication and the decision making process are critical to the successful completion of such projects (Bard, 2015:13).

- **Work from anywhere (BI13):**

  The nature of employment in certain industries require that its employees work from various locations. Therefore employees have to be able to access and share information from various locations (Boshoff, 2014).

- **Collaboration / integration (BI14):**

  As companies are growing it is becoming imperative to integrate unrelated applications in order to perform end-to-end business processes seamlessly within a company. Human intervention relating to data transmission, data alteration and decision making should be limited in order for staff members to focus on their core business activities (Kumar, Gupta & Kapur, 2015:1). In addition to growing companies, those with distributed branches or locations also rely on the integration of applications and sharing of information in order to access the most updated and accurate information from any location at any time.

- **Replicability (BI15):**

  The layout and structure of branches forming part of a company that consists of various branches or locations, should be replicable throughout the entire company in order for the company to portray one uniform image to its customers (Boshoff, 2014).

- **Ease of use (BI16):**

  Various industries face challenges necessitating processes to be easy to use or uniform across locations in order for the company to be successful. Industries confronted with unskilled labour forces, for example, should adapt their processes to meet the skills level of their workforce. Companies with geographically distributed branches face the challenge of management not being available at all of the branches at all times. Therefore it is of utmost importance that the systems, like point-of-sale terminals in retail stores, need to be easy to use (Boshoff, 2014). E-commerce platforms also need to be user-friendly, as customers should be able to navigate the platform without assistance from the company itself. This will motivate online shopping and ultimately lead to the success of online retail companies (Goosen & Rudman, 2013:97).

- **Self-service (BI17):**

  According to Scherer, Wünderlich and Von Wangenheim (2015:177-178) self-service has become more popular than onsite service amongst consumers, as it is more convenient and customers feel more in control of the service they receive. These researchers' study further states that the transition of customers from being a passive audience to becoming active participants can increase productivity in a company and save costs relating to service delivery. Although personal service for tasks of a complicated nature represents better customer service than self-service does, companies can exploit the advantages of self-service for monotonous, unambiguous tasks (Scherer *et al.*, 2015:196).

- **Low level of skills required / available (BI18):**

  Industries aiming to achieve high profitability through lower costs and a large staff compliment, such as retailers, would typically aim for low payroll cost. Therefore semi-skilled or unskilled employees, whose salaries or wages contribute to a lower cost base, will be employed for routine-based tasks at store level (Boshoff, 2014).

- **Minimum staff compliment (BI19):**

  A minimum staff compliment is needed in an environment where highly skilled employees are employed. As the staff costs for these employees will be relatively high, these staff members will have to work in an efficient and effective manner (Boshoff, 2014).

- **High throughput (BI20):**

  In a mass market environment high throughput of products or services is essential to achieve good customer service, which will ensure a competitive advantage (Boshoff, 2014).

- **Reduction of delivery / cycle time (BI21):**

  According to Drury (2015:14) rapid responses to customer requests will contribute to customer satisfaction which, in turn, will give the company a competitive advantage. Customers expect products to be available at all times, which necessitates companies to focus on on-time delivery (Drury, 2015:14). Companies should also reduce the time from the development phase of a new product to taking it to the market to gain a competitive advantage (Drury, 2015:14). Companies therefore need to minimise the cycle time of delivering its products or services and focus its time on activities which adds value to the product, and reduce the time spent on non-value adding activities, such as inspecting, moving and storing raw materials (Drury, 2015:569).

- **Reduction of down time / reliability of systems (BI22):**
  In the e-commerce environment system downtime can be detrimental to the success of the company. The speed of the online shopping facility will translate into the extent of the competitive advantage gained or lost to the company's competitors (Smit, 2009:10). In other environments, such as retail or manufacturing companies, the systems needed for point-of-sale systems and the operation of manufacturing equipment are imperative to the success of the company (Boshoff, 2014). Another example of a system where downtime will be detrimental is the system used by pharmacists to communicate with customers' medical aid systems in real-time (Boshoff, 2014).
- **Mobile access by customers (BI23):**
  In order for a company to have a competitive advantage it needs to provide customers with access to the company's product and service information from their mobile devices (Boshoff, 2014).
- **Customer satisfaction by means of customer service (BI24):**
  45% of the participants of the 2015 global CIO survey indicated that attracting and retaining customers is one of their company's top three priorities (Kark *et al.*, 2015:53). According to Drury (2015:13) companies have to become more focused on customer service in order to survive in the current competitive environment. Improved service delivery, in terms of availability of customer service as well as the quality of customer service, will give certain companies a competitive advantage. Customer service can relate directly to the service(s) the company delivers to their clients or the service surrounding its core product or service.
- **Customer satisfaction by means of customer interaction (BI25):**
  Consumers are gaining access to increasingly more information about various products, services, brands and companies, which assists them in ultimately making their decisions about which product or service they wish to use and which company to obtain it from (Drury, 2015:12). Customer loyalty should be developed by means of effective relationships with customers (Briggs, 2015:52). Tailored interaction with (or targeted marketing towards) customers, addressing their specific requirements, will give companies a competitive advantage (West, Ford & Ibrahim, 2015:152). This sentiment is echoed by Briggs (2015:52) who states that interaction with customers will build relationships with them, which in turn will cultivate customer loyalty. According to Drury (2015:580) many companies are conducting customer surveys in order to determine customer satisfaction levels relating to the quality of the product or service the company delivers. This information is then used to improve customer satisfaction

by taking corrective actions in the areas customer satisfaction is not at the desirable level. In a recent Harvard Business Review, Schrage (2015) noted that educating customers can be equally as important as receiving information from customers. Cultivating a culture, by the manner in which a company interacts with its customers, can influence customers' decisions. According to Schrage (2015), this is where a company can add value and improve its competitive advantage.

- **Leverage skills (BI26):**

  According to Humbert (2007:6) knowledge is the most important asset and the driver of economic input in the Information Age, which is defined by Cambridge dictionaries online (n.d.) as "the era in which the retrieval, management, and transmission of information, especially by using computer technology, is a principal (commercial) activity". In an environment where knowledge sharing is of utmost importance, skills and knowledge will have to be leveraged in order to operate as effectively and efficiently as possible (Boshoff, 2014).

- **High performance teams (BI27):**

  According to Molnau (n.d.) the use of high performance teams to execute complex business objectives is a contributing factor to obtaining a competitive advantage. EY (n.d.) have found, based on a survey of 821 business executives across 14 countries, that companies view teams as an essential driver of superior performance. Cohesiveness amongst team members is critical to the success of high performance teams in achieving business objectives (Molnau, n.d.).

- **Customer centric (BI28):**

  Companies follow a customer-centric approach when customers are prioritised in the business. In order to gain or maintain its competitive advantage companies have to become more driven by their customers and recognise customers as a critical success factor (Drury, 2015:13). The company will therefore look towards its customers in order to determine how its products should be developed or its services adapted (Boshoff, 2014; Brown, 2012).

- **Product centric (BI29):**

  Product-centric companies focus on the capabilities, skills and available resources within the company to determine how its products or services should be developed (Boshoff, 2014; Brown, 2012).

- **Innovation (BI30):**

  Innovation in the business world translates into being the first in, amongst other things, offering a product or service, employ a specific process or develop certain standards (Smit, 2009). 45% of the participants of the 2015 global CIO survey indicated that

innovation is one of their company's top three priorities (Kark *et al.*, 2015:53). According to Goosen and Rudman (2013:97) companies operating in competitive industries, where the difference between the products or services they deliver are marginal, have to continually develop new products or services to gain or maintain its competitive advantage.

- **First movers (BI31):**

  It is imperative for innovative companies to provide the best products or services in its industry. Companies striving to be innovative leaders in their respective industries should for instance be the first to produce new products, deliver innovative, new services, employ a certain process or develop specific standards. According to Kim (2012:142) first movers are those companies which set the standard in the industry they operate in and who may win a big portion of the market share from their new innovative products or services before fast followers follow in their footsteps.

- **Fast follower (BI32):**

  According to Kim (2012:142) the profit making strategy of a fast follower is to utilise the products, services, standards or processes developed by first movers in order to gain benefits from it. According to Snow, as cited by Seave (2014), fast followers experience an average failure rate of 8% compared to a failure rate of 47% experienced by first movers. One of the major contributing factors is that first movers experience a lot of difficulties which fast followers can learn from (Seave, 2014). These statistics make it a very popular imperative for companies to adopt.

- **Rapid adaptability (BI33):**

  Companies, as well as its employees, need to be increasingly adaptable, resourceful and tolerant of uncertainty in order to operate at an optimum level in today's rapidly changing environments (Pulakos, Arad, Donovan & Plamondon, 2000:612). Pulakos *et al.* (2000) proposed eight dimensions of adaptive behaviour in the work place, of which the following three relate to rapid adaptability as a business imperative (Pulakos *et al.,* 2000:617):

  - **Creative problem solving** – Finding new solutions to problems and creating innovative approaches to problems by integrating information in a new and inventive way;
  - **Dealing with uncertain and unpredictable work situations** – Adapting seamlessly when unexpected or unpredictable circumstances arise or events occur by adjusting goals, plans and actions in order to address the altered circumstances; and

  - **Learning new procedures, tasks and technologies** – Proactively gaining new knowledge and skills to adapt to new work processes and procedures by anticipating changes in the work environment and the industry which the company operates in.

- **Up-skilled workforce / decentralisation of authority (BI34):**
  Drury (2015:14) found that when companies allow their employees to make decisions without supervision or approval from management it increases employee morale, decreases cycle time and improves flexibility in the process. This, in turn, leads to increased effectiveness and more efficient processes (Drury, 2015:14). Providing employees, who are directly involved with the operational process and customers, with the necessary information to develop new improved solutions will lead to improvements to the products or services the company delivers (Drury, 2015:14) and will give the company a competitive advantage in the delivery of its products or services. This is also referred to as the decentralisation of authority, according to which a large number of employees are permitted to make decisions in the company (Singh, 2011).
- **Managed processes (BI35):**
  A business process is defined as "an inter-related set of cross-functional activities or events that result in the delivery of a specific product or service to a customer" (ISACA, n.d.). According to Hernaus, Vuksic and Stemberger (2016:173) business processes management provides the necessary coordination between business processes and represents the value-driven part of a company. Having various business processes and managing these processes effectively will lead to increased efficiency of the processes and increase the level of performance of a company (Hernaus *et al.*, 2016:174). Pande and Schrey (2016) state that one of IT's most important objectives in a company is to enable end-to-end business processes. Hernaus *et al.* (2016:186) found that the efficiency, quality and agility of business processes were considerably higher in companies whose senior management puts emphasis on business process management. This, in return, enables senior management to successfully convert their strategic objectives into tangible results through its cross-functional business processes (Hernaus *et al.*, 2016:186).
- **Push or pull operations (BI36):**
  Hopp and Spearman (2004:142) defined a pull production system as a system "that explicitly limits the amount of work in process that can be in the system" and a push production system as "one that has no explicit limit on the amount of work in process that can be in the system". When looking at push or pull operations from a marketing

perspective, Dowling (2004:266) states that a push marketing approach is one according to which the company attempts to push its products or services through the distribution channel to its customers. A pull marketing approach, on the other hand, is an approach whereby the company creates a desire for and interest in the products or services it delivers (Dowling, 2004:266). The company will then react on the demand from its customers by delivering its products or services (Dowling, 2004:266). Whether a company chooses to use the push or pull strategy, it is clear that the company will require sufficient information in order to either forecast the production in a push system or ascertain the demand from the customers in a pull system.

- **Automation (BI37):**

  Chiou, Piazza, Nayak, Brown, Saddul, Ciabarra, Rice, Brannan, Lehtimaki, Rangan and Romero (2016), 11 members of the Forbes Technology Council, listed a number of ways in which automation will affect civilisation in the near future. The first benefit they have identified is a reduction in production costs and an improvement in the quality of products. Automation and the utilisation of technologies such as big data and cognitive analytics will lead to less human intervention (Chiou *et al.*, 2016). The increase of technology-oriented jobs and reduction of human intervention will increase the importance of decisions made by the few employees involved in the decision-making process (Chiou *et al.*, 2016). There is a clear shift from doing manual day-to-day tasks to the need for individuals to apply their minds and making, sometimes critical, decisions (Chiou *et al.*, 2016). As technologies develop, employees will also have to become increasingly more adaptable to changing working environments and tools to be used in the execution of their jobs (Chiou *et al.*, 2016). According to Briggs *et al.* (2016:101), customer service can be automated once a company has sufficient knowledge of incidents logged by and queries received from customers. This will enable customer service which is available twenty four hours a day, seven days a week.

- **Global reach (BI38):**

  Cambridge dictionaries online (n.d.) defines global reach as “the ability of a business to sell to customers in different parts of the world” and further explains that “the internet gives small firms the sort of global reach previously enjoyed only by the largest”. Thus, global reach provides companies with the ability to reach their current customer base in a more effective manner, thereby improving customer service and reaching new customers globally through the use of the internet.

4.1.2 Align business imperatives with the business model canvas

The business imperatives identified in this study were mapped to the nine building blocks of the business model canvas as well as its sub-categories. Refer to Appendix I for an illustration of the alignment between the 38 business imperatives identified in the previous section and the business model canvas' building blocks and their sub-categories (summarised in Table 2). This mapping highlights the business imperatives which are validated by this study and can consequently act as drivers of a company in order to achieve its business objectives.

4.1.3 Align business imperatives with COBIT 5

COBIT 5 focusses on the governance of information and related technology. A thorough study of COBIT 5's domains, enabling processes and governance practices, as summarised by ISACA (n.d.), was performed to identify any mention of the way in which the control objectives, enabling processes and underlying practices of COBIT 5 may support the business objectives of a company. The ways in which a company can gain value from implementing COBIT 5 were aligned with business imperatives in order to validate the hypothesis that business imperatives can act as the basis when aligning IT with its business strategy.

Appendix II summarises the enabling processes and relevant governance practices from the COBIT 5 framework. Certain enabling processes do not contain any governance practices which could be aligned to the business imperatives identified for the purpose of this study or do not provide insight additional to the enabling process which was aligned to business imperatives in its entirety. The governance practices underlying these enabling processes were as a result not included in Appendix II. The specific areas aligned with business imperatives were highlighted by formatting the font as bold in Appendix II.

Appendix III illustrates the alignment between the 38 business imperatives identified in this study (refer to section 4.1.1) with the enabling processes and underlying governance practices of COBIT 5 (as set out in Appendix II). This alignment identifies business imperatives which should be used as a basis for aligning the IT strategy of a company with the ultimate business objectives of the company.

4.1.4 Identify areas of overlap in order to identify business imperatives which are aligned to both the business model canvas and COBIT 5

Table 5 identifies areas of overlap between the alignment of business imperatives with the business model canvas (refer to Appendix II) as well as the alignment of business imperatives with COBIT 5 (refer to Appendix III). The alignment between the business imperatives and the business model canvas highlights business imperatives which can act as drivers of a company to achieve its business objectives. The alignment of business imperatives to COBIT 5 proves that business imperatives should be used as the basis for aligning IT to the business objectives.

The hypothesis that that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap in order to ultimately achieve alignment between business and IT on a component level are validated for those business imperatives which are successfully aligned with the business model canvas and COBIT 5. These are indicated in the last column of Table 5.

Table 5: Areas of overlap between the alignment of business imperatives with the business model canvas and COBIT 5

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
BI1: Regulatory compliance	None	○ APO01.03 Maintain the enablers of the management system; ○ APO01.07 Manage continual improvement of processes; ○ APO03.05 Provide enterprise architecture services; ○ APO04.03 Monitor and scan the technology environment; ○ APO10.03 Manage supplier relationships and contracts; ○ Process: MEA03 Monitor, Evaluate and Assess Compliance with External Requirements; ○ MEA03.01 Identify external compliance requirements; ○ MEA03.02 Optimise response to external requirements; ○ MEA03.03 Confirm external compliance; and ○ MEA03.04 Obtain assurance of external compliance.	No
BI2: High profitability through lower cost	★ Value propositions; ★ Value propositions: Cost reduction; ★ Channels: Indirect channel: partner stores; ★ Channels: Indirect channel: partner wholesaler; ★ Customer relationships: Automated services;	○ EDM02.01 Evaluate value optimisation; ○ Process: EDM04 Ensure Resource Optimisation; ○ EDM04.01 Evaluate resource management; ○ EDM04.02 Direct resource management; ○ EDM04.03 Monitor resource management;	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
	★ Customer relationships: Communities; ★ Customer relationships: Co-creation; ★ Revenue streams ★ Key partnerships: Optimisation and economy of scale; and ★ Cost structure: Cost driven	○ Process: APO03 Manage Enterprise Architecture; ○ APO04.03 Monitor and scan the technology environment; ○ Process: APO05 Manage Portfolio; ○ Process: APO06 Manage Budget and Costs; ○ APO06.01 Manage finance and accounting; ○ APO06.02 Prioritise resource allocation; ○ APO06.04 Model and allocate costs; ○ APO06.05 Manage costs; ○ Process: APO10 Manage Suppliers; ○ APO10.05 Monitor supplier performance and compliance; ○ BAI01.01 Maintain a standard approach for programme and project management; ○ Process: BAI02 Manage Requirements Definition; ○ Process: BAI09 Manage Assets; ○ BAI09.04 Optimise asset costs; and ○ Process: DSS03 Manage Problems	
BI3: High profitability through added value	★ Value propositions; ★ Value propositions: Performance; ★ Value propositions: Design; ★ Value propositions: Brand/status; ★ Revenue streams; ★ Key resources: Intellectual; ★ Key activities: Production;	None. This business imperative refers specifically to creating a product or service of a superior quality than its competitors. Even though the COBIT 5 processes add value to the business by aligning various functions of	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
	★ Cost structure: Value driven	the IT departments with business objectives, it cannot be mapped directly to this specific business imperative. It could, however, improve the quality of the company's product or services indirectly by supporting the business objectives. Therefore this business imperative can be mapped to COBIT 5 in its entirety.	
BI4: Affordability	★ Value propositions: Price; ★ Value propositions: Cost reduction; ★ Value propositions: Accessibility; ★ Revenue streams; ★ Cost structure: Cost driven	○ EDM02.01 Evaluate value optimisation; ○ EDM04.01 Evaluate resource management; ○ EDM04.02 Direct resource management; and ○ EDM04.03 Monitor resource management.	Yes
BI5: Diverse products or lines of business	★ Customer segments: Segmented; ★ Customer segments: Diversified; ★ Customer segments: Multi-sided platforms; ★ Value propositions: Customisation	None	No
BI6: Reliability and quality of products and services	★ Value propositions; ★ Value propositions: Performance; ★ Value propositions: Design; ★ Key resources: Intellectual; ★ Key activities: Production;	○ Process: APO11 Manage Quality; ○ APO11.01 Establish a quality management system (QMS); ○ APO11.02 Define and manage quality standards, practices and procedures;	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
	★ Key activities: Problem solving; ★ Cost structure: Value-driven	○ APO11.06 Maintain continuous improvement; and ○ BAI01.01 Maintain a standard approach for programme and project management.	
BI7: Reliability of information	★ Key resources: Intellectual; ★ Key activities: Problem solving	○ EDM05.01 Evaluate stakeholder reporting requirements; ○ EDM05.02 Direct stakeholder communication and reporting; ○ EDM05.03 Monitor stakeholder communication; ○ APO01.01 Define the organisational structure; ○ APO11.06 Maintain continuous improvement; ○ APO01.03 Maintain the enablers of the management system; ○ APO01.06 Define information (data) and system ownership; ○ Process: APO03 Manage Enterprise Architecture; ○ Process: APO06 Manage Budget and Costs; ○ APO06.04 Model and allocate costs; ○ APO06.05 Manage costs; ○ APO11.01 Establish a quality management system (QMS); ○ Process: APO13 Manage Security; ○ APO13.01 Establish and maintain an ISMS; ○ APO13.02 Define and manage an information security risk treatment plan;	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
		○ APO13.03 Monitor and review the ISMS; ○ BAI01.03 Manage stakeholder engagement; ○ Process: BAI02 Manage Requirements Definition; ○ Process: BAI03 Manage Solutions Identification and Build; ○ BAI03.05 Build solutions; ○ Process: BAI08 Manage Knowledge; ○ BAI08.02 Identify and classify sources of information; ○ BAI08.04 Use and share knowledge; ○ BAI08.05 Evaluate and retire information; ○ Process: DSS04 Manage Continuity; ○ Process: DSS05 Manage Security Services; ○ DSS05.01 Protect against malware; ○ DSS05.02 Manage network and connectivity security; ○ DSS05.03 Manage endpoint security; ○ DSS05.04 Manage user identity and logical access; ○ DSS05.06 Manage sensitive documents and output devices; ○ DSS05.07 Monitor the infrastructure for security-related events; ○ Process: DSS06 Manage Business Process Controls; ○ DSS06.02 Control the processing of information;	

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
		○ DSS06.03 Manage roles, responsibilities, access privileges and levels of authority; ○ DSS06.04 Manage errors and exceptions; ○ DSS06.05 Ensure traceability of information events and accountabilities; and ○ DSS06.06 Secure information assets.	
BI8: Proactive manage-ment	★ Value propositions: Newness.	○ EDM05.01 Evaluate stakeholder reporting requirements; ○ EDM05.02 Direct stakeholder communication and reporting; and ○ EDM05.03 Monitor stakeholder communication.	Yes
BI9: Productivity and efficiency	★ Value propositions: “Getting the job done”.	○ Process: APO04 Manage Innovation ○ Process: BAI08 Manage Knowledge; ○ Process: DSS02 Manage Service Requests and Incidents; and ○ Process: DSS03 Manage Problems	Yes
BI10: Distributed branches	★ Channels: Awareness; ★ Channels: Purchase; ★ Channels: Delivery; ★ Channels: Direct channel: sales force; ★ Channels: Indirect channel: own stores; ★ Channels: Indirect channel: partner stores; ★ Channels: Indirect channel: partner wholesaler; ★ Key resources: Physical	None	No

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
BI11: Distributed processes	★ Channels: Indirect channel: own stores; ★ Channels: Indirect channel: partner stores; ★ Channels: Indirect channel: partner wholesaler; ★ Key resources: Physical	None	No
BI12: Distributed / hybrid project teams	★ Channels: Indirect channel: own stores; ★ Channels: Indirect channel: partner stores; ★ Channels: Indirect channel: partner wholesaler.	○ BAI08.01 Nurture and facilitate a knowledge-sharing culture.	Yes
BI13: Work from anywhere	★ Channels: Indirect channel: own stores; ★ Customer relationships: Personal assistance; ★ Customer relationships: Dedicated personal assistance.	None	No
BI14: Collabora-tion / integration	★ Key activities: Platform / network	○ APO04.01 Create an environment conducive to innovation; ○ APO04.03 Monitor and scan the technology environment; ○ APO04.06 Monitor the implementation and use of innovation; ○ APO11.01 Establish a quality management system (QMS). ○ BAI03.02 Design detailed solution components; and ○ BAI08.01 Nurture and facilitate a knowledge-sharing culture.	Yes
BI15: Replicability	★ Channels: Awareness; ★ Channels: Direct channel: sales force; ★ Channels: Indirect channel: own stores;	None	No

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
	★ Channels: Indirect channel: partner stores; ★ Channels: Indirect channel: partner wholesaler; ★ Key resources: Physical		
BI16: Ease of use	★ Channels: Purchase; ★ Channels: Direct channel: web sales; ★ Customer relationships: Self-service; ★ Customer relationships: Automated service; ★ Customer relationships: Communities; ★ Customer relationships: Co-creation; ★ Key activities: Platform / network.	○ APO01.05 Optimise the placement of the IT function; ○ APO07.03 Maintain the skills and competencies of personnel; and ○ APO07.05 Plan and track the usage of IT and business human resources.	Yes
BI17: Self-service	★ Value proposition: Accessibility; ★ Value proposition: Convenience / usability; ★ Channels: Purchase ★ Channels: Direct channel: web sales; ★ Customer relationships: Self-service; ★ Customer relationships: Automated service; ★ Customer relationships: Communities; ★ Customer relationships: Co-creation.	○ APO01.05 Optimise the placement of the IT function.	Yes
BI18: Low level of skills required	★ Channels: Indirect channel: own stores; ★ Cost structure: Cost-driven	○ APO01.05 Optimise the placement of the IT function; ○ APO07.01 Maintain adequate and appropriate staffing; ○ APO07.03 Maintain the skills and competencies of personnel; and ○ APO07.05 Plan and track the usage of IT and	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
		business human resources.	
BI19: Minimum staff compliment	★ Key resources: Intellectual; ★ Key resources: Human; ★ Key activities: Problem solving.	○ APO07.01 Maintain adequate and appropriate staffing.	Yes
BI20: High throughput	★ Customer segments: Mass market; ★ Value propositions: “Getting the job done”.	○ BAI04.01 Assess current availability, performance and capacity and create a baseline; ○ BAI04.04 Monitor and review availability and capacity; ○ BAI04.05 Investigate and address availability, performance and capacity issues;	Yes
BI21: Reduction of delivery / cycle time	★ Value propositions; ★ Value propositions: “Getting the job done”; ★ Channels: Delivery; ★ Key activities: Production.	○ BAI04.01 Assess current availability, performance and capacity and create a baseline; ○ BAI04.04 Monitor and review availability and capacity; and ○ BAI04.05 Investigate and address availability, performance and capacity issues.	Yes
BI22: Reduction of down time / reliability of systems	★ Value propositions: “Getting the job done”; ★ Channels: Direct channel: Web sales; ★ Customer relationships: Self-service; ★ Customer relationships: Automated services; ★ Key activities: Platform / network.	○ BAI04.01 Assess current availability, performance and capacity and create a baseline; ○ BAI04.02 Assess business impact; ○ BAI04.04 Monitor and review availability and capacity; ○ BAI04.05 Investigate and address availability, performance and capacity issues; ○ Process: DSS02 Manage Service Requests and Incidents;	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
		○ Process: DSS03 Manage Problems; and ○ Process: DSS04 Manage Continuity	
BI23: Mobile access by customers	★ Value propositions: accessibility; ★ Value propositions: Convenience / usability; ★ Channels: Awareness; ★ Channels: Purchase; ★ Channels: Direct channel: Web sales; ★ Customer relationships: Self-service; ★ Key activities: Platform / network.	None	No
BI24: Customer satisfaction by means of customer service	★ Customer segments; ★ Customer segments: Niche market; ★ Customer segments: Segmented; ★ Customer segments: Diversified; ★ Customer segments: Multi-sided platforms; ★ Value propositions: Risk reduction; ★ Channels; ★ Channels: Purchase; ★ Channels: Delivery; ★ Channels: After sales ★ Customer relationships: Personal assistance; ★ Customer relationships: Dedicated personal assistance; ★ Customer relationships: Self-service; ★ Key activities: Problem solving; ★ Cost structure: Value driven.	○ APO11.03 Focus quality management on customers; and ○ Process: DSS03 Manage Problems.	Yes
BI25: Customer	★ Customer segments: Niche market;	○ APO11.04 Perform quality monitoring, control and reviews; and	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
satisfaction by means of customer interaction	★ Customer segments: Segmented; ★ Customer segments: Diversified; ★ Customer segments: Multi-sided platforms; ★ Value propositions: Customisation; ★ Channels; ★ Channels: Awareness; ★ Channels: Evaluation; ★ Channels: Purchase; ★ Customer relationships: Personal assistance; ★ Customer relationships: Dedicated personal assistance; ★ Customer relationships: Self-service; ★ Customer relationships: Communities; ★ Key resources: Intellectual; ★ Cost structure: Value driven.	○ BAI08.03 Organise and contextualise information into knowledge.	
BI26: Leverage skills	★ Customer relationships: Communities; ★ Key resources: Intellectual; ★ Key resources: Human; ★ Key activities: Problem solving.	○ APO07.03 Maintain the skills and competencies of personnel; ○ APO07.05 Plan and track the usage of IT and business human resources; and ○ BAI08.01 Nurture and facilitate a knowledge-sharing culture.	Yes
BI27: High performance teams	★ Key resources: Intellectual; ★ Key resources: Human; ★ Key activities: Problem solving.	○ APO01.05 Optimise the placement of the IT function. ○ BAI08.01 Nurture and facilitate a knowledge-sharing culture.	Yes
BI28: Customer centric	★ Customer segments; ★ Customer segments: Mass market;	○ APO11.03 Focus quality management on customers; and	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
	★ Customer segments: Niche market; ★ Customer segments: Segmented; ★ Customer segments: Diversified; ★ Customer segments: Multi-sided platforms; ★ Customer relationships: Personal assistance; ★ Customer relationships: Dedicated personal assistance; ★ Cost structure: Value driven.	○ BAI08.03 Organise and contextualise information into knowledge.	
BI29: Product centric	★ Value propositions; ★ Key resources: Intellectual; ★ Cost structure: Value driven.	○ BAI08.03 Organise and contextualise information into knowledge.	Yes
BI30: Innovation	★ Value propositions; ★ Value propositions: Newness; ★ Key resources: Intellectual; ★ Key activities: Problem solving.	○ Process: APO04 Manage Innovation; ○ APO04.01 Create an environment conducive to innovation; ○ APO04.02 Maintain an understanding of the enterprise environment; ○ APO04.03 Monitor and scan the technology environment; ○ APO04.04 Assess the potential of emerging technologies and innovation ideas; ○ APO04.05 Recommend appropriate further initiatives; ○ APO04.06 Monitor the implementation and use of innovation; and ○ BAI08.03 Organise and contextualise information into knowledge.	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
BI31: First movers	★ Value propositions; ★ Value propositions: Newness.	○ APO04.01 Create an environment conducive to innovation; ○ APO04.03 Monitor and scan the technology environment; ○ APO04.04 Assess the potential of emerging technologies and innovation ideas; ○ APO04.05 Recommend appropriate further initiatives; ○ APO04.06 Monitor the implementation and use of innovation; and ○ BAI08.03 Organise and contextualise information into knowledge.	Yes
BI32: Fast follower	★ Value propositions.	○ Process: BAI06 Manage Changes; and ○ BAI08.03 Organise and contextualise information into knowledge.	Yes
BI33: Rapid adaptability	★ Value propositions; ★ Key resources: Intellectual; ★ Key activities: Problem solving.	○ BAI04.03 Plan for new or changed service requirements; ○ Process: BAI05 Manage Organisational Change Enablement; ○ Process: BAI06 Manage Changes; ○ Process: BAI07 Manage Change Acceptance and Transitioning; and ○ BAI08.03 Organise and contextualise information into knowledge.	Yes
BI34: Up-skilled workforce / decentrali-	★ Value propositions: “Getting the job done”; ★ Channels: Indirect channel: own stores; ★ Key resources: Intellectual;	○ APO01.05 Optimise the placement of the IT function; ○ APO07.03 Maintain the skills and competencies of personnel;	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
sation of authority		○ APO07.05 Plan and track the usage of IT and business human resources; and ○ BAI08.03 Organise and contextualise information into knowledge.	
BI35: Managed processes	★ This business imperative can be linked to a company's business model in its entirety.	○ APO01.05 Optimise the placement of the IT function; ○ APO04.03 Monitor and scan the technology environment; ○ Process: APO11 Manage Quality; ○ APO11.01 Establish a quality management system (QMS); ○ Process: BAI02 Manage Requirements Definition; ○ Process: BAI03 Manage Solutions Identification and Build; ○ BAI03.02 Design detailed solution components; ○ BAI03.05 Build solutions; ○ Process: DSS06 Manage Business Process Controls; ○ DSS06.01 Align control activities embedded in business processes with enterprise objectives; ○ DSS06.02 Control the processing of information; ○ DSS06.03 Manage roles, responsibilities, access privileges and levels of authority. ○ DSS06.04 Manage errors and exceptions; and ○ DSS06.05 Ensure traceability of information events and accountabilities.	Yes

Business imperatives (section 4.1.1)	Aligned with business model canvas (Appendix I)	Aligned with COBIT 5 (Appendix III)	Hypothesis validated (yes / no)
BI36: Push or pull operations	★ Channels: Awareness; ★ Channels: Delivery.	○ APO04.03 Monitor and scan the technology environment; and ○ BAI08.03 Organise and contextualise information into knowledge.	Yes
BI37: Automation	★ Customer relationships: Automated services; ★ Cost structure: Cost driven.	○ APO01.05 Optimise the placement of the IT function; ○ APO01.07 Manage continual improvement of processes; and ○ BAI08.03 Organise and contextualise information into knowledge.	Yes
BI38: Global reach	★ Channels: Direct channel: Web sales; ★ Customer relationships: Automated services.	None	No

According to Table 5 the hypothesis that that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap to ultimately achieve alignment between business and IT on a component level is validated for 30 of the 38 business imperatives. The business imperatives which could not be validated are:

- BI1: Regulatory compliance;
- BI5: Diverse products or lines of business;
- BI10: Distributed branches;
- BI11: Distributed processes;
- BI13: Work from anywhere;
- BI15: Replicability;
- BI23: Mobile access by customers;
- BI38: Global reach.

Regulatory compliance (BI1) is not addressed in the business model canvas and can therefore not be seen as a driver of the business for the purpose of this study.

Diverse products or lines of business (BI5), distributed branches (BI10), distributed processes (BI11), work from anywhere (BI13), replicability (BI15), mobile access by customers (BI23)

and global reach (BI38) are not directly supported by the enabling processes and governance practices in COBIT 5. As these business imperatives could not be mapped to COBIT 5, the hypothesis that these business imperatives can be used as the basis of alignment between business and IT strategies, are not validated.

The business imperatives which could not be aligned with COBIT 5 do however require specific IT architecture to enable them. COBIT 5 describes the general IT architecture needed to give effect to these business imperatives.

4.2 Aligning validated business imperatives with IT architecture

After identifying the business imperatives relevant to a specific company, the requirements of the IT architecture should be determined in order to successfully align a company's IT architecture with its business imperatives. This study provides two options for aligning the business imperatives of a company with its IT architecture.

- **Implementation guidance:** The first option is to use the implementation guidance provided in 4.2.1 to assess the impact of business imperatives on the IT architecture of a company (refer to Step 6 of the research methodology in section 2.2).
- **Framework:** Alternatively, the framework provided in 4.2.2 can be used to align a company's business imperatives with its IT architecture (refer to Steps 7, 8 and 9 of the research methodology in section 2.2).

4.2.1 Implementation guidance to align IT architecture with the business imperatives of a company

As discussed in section 3.6, IT architecture is defined, for the purpose of this study, as the conceptual design of IT components, including the interrelationship between these components, and the principles and guidelines governing the design, which should be maintained and evolved in order to achieve a company's IT goals and, ultimately, the strategic goals of the company (Zachman, 2015; Boshoff, 2014; International Organization Of Standardization, 2011; The Open Group, 2011; Op't Land *et al.,* 2009:35; ISACA, n.d.).

The first step in achieving alignment between the business imperatives and IT architecture of a company is to identify their business imperatives. According to Boshoff (2014), each company should have a maximum of five to seven business imperatives. Senior management can use the business imperatives validated by the mapping performed in Table 5 as guidance in order to identify the business imperatives relevant to their own company.

Each validated business imperative necessitates certain actions from the company in order to ensure alignment between IT architecture and its business imperatives. Therefore the second step is for senior management to determine the requirements of business (business requirements) in order to give effect to business imperatives identified as drivers of their company. Examples of company requirements are provided in Appendix IV.

Once the business requirements have been established, the impact on the IT architecture of the company can be determined by assessing how IT can support the business requirements needed to give effect to the business imperative identified by a company. A list of potential ways in which IT can support the business in order to give effect to business imperatives is provided in Appendix V. The different components of IT architecture as provided in 3.6 should be taken into account when determining the impact on IT architecture by determining which component will be affected by the business requirement relevant to the business imperative. Senior management will also need to determine what is required from this component of IT architecture to give effect to the business imperative concerned.

This process will ensure that the design of the IT architecture of the company gives effect to its business imperatives and in this way ensure alignment between business' strategic objectives and the IT strategy in order to eliminate the IT Gap.

4.2.2 Framework to use as a template to align business imperatives with IT architecture

4.2.2.1 An overview of the framework

For the purpose of this study, a list of 38 generic business imperatives were defined in section 4.1.1. The hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap by designing IT architecture, as well as the access path components and access path processes, which will support the successful execution of the business imperatives of a particular company in order to ultimately achieve alignment

between business and IT on a component level, was validated for 30 of the 38 generic business imperatives in section 4.1.4. These validated business imperatives form the basis of the framework which allows senior management to identify the business imperatives most applicable to their company, which are in alignment with their specific strategic goals.

The framework provides guidance regarding the impact of the company's business imperatives on the IT architecture of a company in order to enable a company to determine the various access path components and the process surrounding each component (i.e. the build, setup, configuration, operating and maintenance of each component) necessary to ensure alignment between IT architecture and business imperatives. After identifying the most relevant business imperatives for the specific company, senior management needs to determine what the business requires in order to give effect to each of its business imperatives, referred to as business requirements. The business requirements will be used to determine the requirements for the IT architecture of the company. This process will ensure that the IT architecture of the company gives effect to its business imperatives.

For this purpose, a list of potential business requirements needed to give effect to the validated business imperatives, was developed in Appendix IV. These business requirements are mapped to the validated business imperatives in Table 6. Various ways in which the design of the IT architecture of a company can be altered in order to meet the aforementioned requirements of the business are listed in Appendix V and mapped to the business requirements attached to the relevant business imperatives in Table 6.

4.2.2.2 Implementation guidance of the framework

Certain business imperatives were validated as business drivers in section 4.1.4. These business imperatives should be used as the basis to bridge the IT gap in order to ultimately achieve alignment between business and IT on a component level. Regulatory compliance (BI1), diverse products or lines of business (BI5), distributed branches (BI10), distributed processes (BI11), work from anywhere (BI13), replicability (BI15), mobile access by customers (BI23) and global reach (BI38) were however not validated.

Table 6 contains the mapping performed between the validated business imperatives (refer to section 4.1.4), the relevant business requirements (refer to Appendix IV) and its impact on IT architecture (refer to Appendix V). After identifying the business imperatives most relevant to a company, the framework provided in Table 6 can be used to determine the business

requirements as well as the requirements from the IT architecture of a company necessary in order to give effect to the business imperatives.

Table 6: Framework to align business imperatives to business requirements and the impact on IT architecture of a company

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
BI2: High profitability through lower cost	**2) Low cost base and focus on value-added activities**; **3) Accurate, reliable information** regarding costing; 7) **quality management and improvement**; and 10) **improvement of cycle times.**	ii) IT hardware and software should be low in cost and **scalable** in order to keep the costs low in case of growth of the company; iii) the **value added** from IT investments should exceed the cost of ownership; iv) the application used as a costing system should be **accurate and reliable**; and xxx) **cloud computing**.
BI3: High profitability through added value	**2) Low cost base and focus on value-added activities**; **3) accurate, reliable information** regarding the quality of a company's products and services; **4) increased efficiency** in the operations of the company; 7) **quality management and improvement**; and 10) **improvement of cycle times.**	ii) IT hardware and software should be low in cost and **scalable** in order to support potential growth of the company; iii) the **value added** from IT investments should exceed the cost of ownership; iv) the application used to process information should be **accurate and reliable** and support business decisions; v) the application used should deliver **real-time** information *(also refer to xiii: ERP system*

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
		and xiv: workflow management); and vi) the application used should **increase efficiency** by means of **Online Transacting Processing (OLTP).**
BI4: Affordability	**2) Low cost base and focus on value-added activities** – costs should be kept to a minimum without compromising the quality of goods and/or services delivered; **3) accurate, reliable information** regarding costing in order to control and manage costs; and 7) **quality management and improvement**;	ii) IT hardware and software should be low in cost and **scalable** in order to support potential growth of the company; iii) the **value added** from IT investments should exceed the cost of ownership; iv) the application used as a costing system should be **accurate and reliable** and support business decisions; and xxx) **cloud computing**.
BI6: Reliability and quality of products and services	**3) Accurate, reliable information** relating to quality management; 6) o**n time delivery** of products and services to clients; and 7) **quality management and improvement.**	iv) The application used to process information should be **accurate and reliable**; and ix) a **robust system** is needed as little or no system downtime is required to facilitate the processing of and access to quality information and logistics documentation needed for on time delivery.
BI7: Reliability of information	3) **Accurate, reliable information** relating to quality management; and	iv) The application used to process information should be **accurate and reliable**;

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
	8) regular **back-ups** should be made and a **contingency plan** should be in place in case of loss of data.	x) **redundancy** in the form of back-up equipment is required; xi) **uninterruptible power-supply** is required for hardware components; xxx) **cloud computing -** cloud-based back-ups can be made regularly; and xxxii) **minimising of information security vulnerabilities**.
BI8: Proactive management	**3) Real-time, accurate, reliable information** is needed to manage high levels of uncertainty relating to, *inter alia* changing customer needs and demands, changes in the economic environment, climate changes, technological advancements, etc.	iv) The application used to process information should be **accurate and reliable**; vi) **Online Transacting Processing (OLTP);** xii) specialised **integrated applications**; xiii) a reliable enterprise resource planning (**ERP system**) is needed; xiv) **workflow management**; and xvi) **collaborative computing**.
BI9: Productivity and efficiency	3) **Accurate, reliable information** for decision-making; 4) **Increased efficiency;**	iv) The application used for processing data should be **accurate and reliable**; vi) the application used should **increase efficiency** by means

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
	9) **automation of business processes**; 10) **improvement of cycle times**; and 21) **Efficient workflow.**	of **Online Transacting Processing (OLTP)**; xii) specialised **integrated applications**; xiii) a reliable enterprise resource planning (**ERP system**) is needed; xiv) **workflow management**; and xxxi) **Internet of Things**.
BI12: Distributed / hybrid project teams	13) **Knowledge sharing and communication**; and 15) **Strong security measures.**	xvi) **Collaborative computing**; xvii) **ubiquitous computing**; xviii) **reliable connection**; xx) **central server;** and xxx) **cloud computing**.
BI14: Collaboration / integration	16) **Information sharing within the company**; and 17) **Enterprise Application Integration (EAI)**.	xx) **Central server**; xxi) **supply chain management** and **customer relationship management** systems; xxx) **cloud computing;** and xxxi) **Internet of Things**.
BI16: Ease of use	18) **Low level of skills required**.	xxii) **User-friendly interfaces and basic workflows.**
BI17: Self-service	18) **Low level of skills required**; and 19) **minimum staff intervention.**	xxii) **Easy to use, user-friendly interfaces and basic workflows;** and xxiii) **highly automated** applications.
BI18: Low level of skills required	20) **Deskilling operations.**	xxii) **User-friendly interfaces and basic workflows.**

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
BI19: Minimum staff compliment	21) **Efficient workflow.**	xiii) a reliable enterprise resource planning (**ERP system**) is needed; xiv) **workflow management**; and xxiii) **Highly automated** applications.
BI20: High throughput	18) **Low level of skills required** and the user-interface should require minimum input from the staff member.	xxii) **User-friendly interfaces and basic workflows;** xxiii) **highly automated** applications; and xxiv) **connectivity and high processing speed.**
BI21: Reduction of delivery / cycle time	2) **Focus on value-added activities;** 6) **on time delivery** of products and services to clients; 9) staff efficiency should be improved by **automation of business processes;** 10) **improvement of cycle times;** and 21) **efficient workflow.**	iii) The **value added** from IT investments should exceed the cost of ownership; iv) the application used to monitor time spent on various activities should be **accurate and reliable** to identify and report inefficient activities; ix) a **robust system** is needed as little or no system downtime is required to facilitate the processing of and access to quality information and logistics documentation needed for on time deliver; xii) specialised **integrated applications**; xiii) a reliable enterprise resource planning (**ERP system**) is needed;

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
		xiv) **workflow management**; xxiii) **highly automated** applications; xxiv) **connectivity and high processing speed**; and xxxi) **Internet of Things**.
BI22: Reduction of down time / reliability of systems	22) **Little or no downtime or outages.**	ix) a **robust system** is needed as little or no system downtime is required to facilitate the processing of transactions; x) **redundancy** in the form of back-up equipment is required; xi) **uninterruptible power-supply** is required for hardware components; and xxx) **cloud computing -** cloud-based back-ups can be made regularly.
BI24: Customer satisfaction by means of customer service	**3) Accurate, reliable information** is needed to inform customers about the availability and cycle time of products, for example; 25) the **process** employed at the point of sale terminals or the e-commerce platform need to be **effective and efficient**; and 28) the company should **obtain access to information about its customers.**	iv) The application used to process, store and monitor information relating to customers, including complaints and how these complaints were handled, should be **accurate and reliable**; xiii) a reliable enterprise resource planning (**ERP system**) is needed; xiv) **workflow management** in the form of automated

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
		processes at the point of sale terminal is required. Routine human intervention should be limited and additional human intervention only required in exceptional circumstances, for example to provide authorisation to correct mistakes made by employees at the point of sale terminal; and xxiii) **highly automated** applications.
BI25: Customer satisfaction by means of customer interaction	24) Companies need to **tailor their interaction** with clients and / or **adapt their marketing campaigns** to gain information from customers or educate customers; and 28) the company should **obtain access to information about its customers.**	iv) The application used to store and monitor information about customer behaviour should be **accurate and reliable**; xxv) applications used for mobile connection should be **compatible** with mobile devices and **data protection software** should be installed; xxvi) **customer loyalty application**; xxvii) **big data, analytics and improved decision making**; and xxxi) **Internet of Things**.
BI26: Leverage skills	26) Sharing of **centralisation** of information.	xxviii) **Power user tools.**
BI27: High performance teams	26) Sharing of **centralisation** of information; and	xxviii) **Power user tools**;

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
	27) **Enablement.**	xxix) **technology enabled** communication tools; and vi) the application used should **increase efficiency** by means of **Online Transacting Processing (OLTP).**
BI28: Customer centric	28) The company should **obtain access to information about its customers.**	iv) The application used to process, store and monitor information relating to customers, including complaints and how these complaints were handled, should be **accurate and reliable**; xxvi) **customer loyalty application**; xxvii) **big data, analytics and improved decision making**; and xxxi) **Internet of Things**.
BI29: Product centric	3) **Reliable information** is needed in order to develop new products or services to ensure that the company creates the best product of its type.	iv) The application used to process, store and monitor information relating to customers, products and markets should be **accurate, reliable and up to date**; xxvii) **big data, analytics and improved decision making** relating to the production process; and xxxi) **Internet of Things**.
BI30: Innovation	3) **Real-time, accurate, reliable information** is	iv) The application used to process, store and monitor

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
	needed to manage high levels of uncertainty relating to, *inter alia* changing customer needs and demands, changes in the economic environment, climate changes, technological advancements, etc.; 26) **centralisation** of information; and 29) **gathering and analysing** information in order to **adapt** continually.	information relating to customers, products and markets should be **accurate, reliable and up to date**; xxvii) **big data, analytics and improved decision making;** vi) the application used should **increase efficiency** by means of **Online Transacting Processing (OLTP)**; and xxxi) **Internet of Things**.
BI31: First movers	3) **Real-time, accurate, reliable information** is needed to manage high levels of uncertainty relating to, *inter alia* changing customer needs and demands, changes in the economic environment, climate changes, technological advancements, etc.; 5) **adaptability and flexibility**; 26) **centralisation** of information; and 29) **gathering and analysing** information in order to **adapt** and be the first company to produce a new product or deliver a new service accordingly.	iv) The application used to process, store and monitor information relating to customers, products and markets should be **accurate, reliable and up to date**; and xxvii) **big data, analytics and improved decision making.**
BI32: Fast follower	3) **Reliable information** is needed for decision making;	iv) The application used to process, store and monitor information relating to

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
	29) **gathering and analysing** information about innovative products or services first movers brought to the market, how customers received it and the problems first followers encountered; and 30) **adaptability of employees.**	customers, products and markets should be **accurate, reliable and up to date**; and xxvii) **big data, analytics and improved decision making.**
BI33: Rapid adaptability • **Creative problem solving;** • **Dealing with uncertain and unpredictable work situations; and** • **Learning new procedures, tasks and technologies.**	3) **Reliable information** is needed for decision making; and 29) **gathering and analysing** information in order to predict future developments in the work environment and the industry the company operates in to reduce uncertainty, find solutions to problems.	iv) The application used to process, store and monitor information relating to customers, products and markets should be **accurate, reliable and up to date**; and xxvii) **big data, analytics and improved decision making.**
BI34: Up-skilled workforce / decentralisation of authority	3) **Reliable information** is needed for decision making by the employees directly involved with the operational processes and customers; and 28) sharing and **centralisation** of information.	iv) The application used for processing data should be **accurate and reliable** and made available to the staff members responsible for decision making; and xxvii) **big data, analytics and improved decision making** relating to the production process.

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
BI35: Managed processes	9) **Automation of business processes.**	xiii) A reliable enterprise resource planning (**ERP system**) is needed; xiv) **workflow management**; xx) **central** server; xxx) **cloud computing**; and xxxi) **Internet of Things**.
BI36: Push or pull operations	3) **Reliable information** is needed for decision making in both push and pull operations; 24) **tailored interaction**; 28) in pull operations the company should **obtain access to information about its customers** in order to plan its production; and 17) **Enterprise Application Integration (EAI)** is important in pull operations. Managers need to obtain information about the production process and inventory levels to manage the production process in order to have no work in progress.	iv) The application used to process, store and monitor information should be **accurate and reliable**; xx) **central** server; xxvi) **mobile customer loyalty applications**; and xxvii) **big data, analytics and improved decision making** relating to the production process.
BI37: Automation	3) **Reliable information** is needed for decision making in both push and pull operations; and 30) **important decisions** made by employees and increased **adaptability** required from employees.	iv) The application used for processing data should be **accurate and reliable** and made available to the staff members responsible for decision making; vi) **Online Transacting Processing (OLTP)**;

Business imperative (section 4.1.4)	Business requirement (Appendix IV)	Impact on IT Architecture (Appendix V)
		xiv) **workflow management**; xxvii) **big data, analytics and improved decision making**; and xxxi) **Internet of Things**.

As illustrated in Figure 3 on page 56, alignment between business- and IT objectives can only be achieved successfully at the strategic level of a company when both the impact of business imperatives on the IT architecture of a company (as summarised in Table 6 above) and the basic business assumptions of a company is taken into account. This will assist senior management to determine the IT strategy of the company.

IT architecture, along with the basic business assumptions, should be used to design the access path components as well as the access path processes. This will ensure the alignment between business and IT at an operational level.

CHAPTER 5: CONCLUSION

IT is developing at a rapid pace and this development is changing the business landscape in every way (Briggs *et al.*, 2016:2-3; Pande & Schrey, 2016). Senior management is consequently forced to consider how IT can be utilised to improve the market share of a company by increasing its competitive advantage (Osterwalder, 2004:13). According to the introduction of the King III report information systems can no longer be looked at in isolation as it forms part the strategy of a company (Institute of Directors Southern Africa, 2009:16). King III consequently requires companies to integrate their IT strategies with their overall business strategies and highlights the importance of IT having to add value to a company by enhancing its performance (Institute of Directors Southern Africa, 2009:83).

Alignment between senior management and IT specialists is of critical importance to achieve strategic alignment between the business objectives of a company and its IT strategy, and for IT to ultimately add value to the company (Institute of Directors Southern Africa, 2009:83). Miscommunication between senior management and the IT department is however very common and therefore the IT gap, i.e. a gap between business and IT, is prevalent in most companies (Khan *et al.*, 2016; Rudman, 2011:37; Osterwalder, 2004:16).

This study aimed to provide guidance to companies who want to design its IT architecture in line with its business imperatives and ultimately its business objectives. Firstly, this study provides implementation guidance to companies to design IT architecture in line with their business imperative without using the framework developed in this study. Alternatively, a framework, consisting of a list of validated business imperatives and its potential impact on the IT architecture of a company that was developed, can be used.

The first step in creating the framework was to validate the hypothesis that business imperatives act as the drivers of a company and should be used as the basis to bridge the IT gap in order to ultimately achieve alignment between business and IT on a component level. This was done by aligning a list of business imperatives with the business model canvas and COBIT 5. The next step was to determine the business requirements for each of the validated business imperatives. Lastly, the impact of the business requirements on the IT architecture was determined in order to ensure that the IT architecture of a company gives effect to its business imperatives.

As this study did not include the following areas, further research relating to the following remain to be conducted:

- Determining the specific access path components to be implemented to support the business imperatives relevant to a company; and
- Determining the process surrounding each of the above mentioned access path components (i.e. the build, setup, configurations, operating and maintenance of each component).

The framework developed in this study provides practical guidance to assist senior management of companies to identify the business imperatives relevant to their company. Subsequently, the framework provides guidance to IT specialists to design IT architecture which will support the business imperatives of the company.

The framework can be used to improve communication relating to strategic alignment between senior management and IT specialists by using the framework as a basis for discussion. This will enable senior management and IT specialists to engage in the design, implementation and revision of the IT architecture in order for IT to successfully support the business in achieving its strategic objectives (Bowen *et al.*, 2007:191). The framework will also support the board of directors, who remain ultimately responsible for IT governance (Institute of Directors Southern Africa, 2009:82) as they may use the framework to facilitate communication between senior management and IT specialists, and hold each of these parties accountable for designing, implementing and revising IT architecture in line with business imperatives. Ultimately, the utilisation of the framework by the various parties involved, will reduce the IT gap. By implementing this framework a company can ensure strategic alignment between their business' strategic objectives and its IT strategy.

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Appendix I: Alignment of business imperatives with the business model canvas

| Business Imperatives (section 4.1.1.) | | |

| Business Imperatives (section 4.1.1.) | | |

Business Imperatives (section 4.1.1.)																																							
Nine building blocks of the business model canvas (section 3.4.3.)	**BI1**	**BI2**	**BI3**	**BI4**	**BI5**	**BI6**	**BI7**	**BI8**	**BI9**	**BI10**	**BI11**	**BI12**	**BI13**	**BI14**	**BI15**	**BI16**	**BI17**	**BI18**	**BI19**	**BI20**	**BI21**	**BI22**	**BI23**	**BI24**	**BI25**	**BI26**	**BI27**	**BI28**	**BI29**	**BI30**	**BI31**	**BI32**	**BI33**	**BI34**	**BI35**	**BI36**	**BI37**	**BI38**
*Usage fees																																							
*Subscription fees																																							
*Lending / renting / leasing																																							
*Licensing																																							
*Brokerage fees																																							
*Advertising																																							
Key resources																																							
*Physical										x	x				x																								
*Intellectual			x			x	x												x						x	x	x		x	x			x	x					
*Human																			x							x	x												
*Financial																																							
Key activities																																							
*Production			x			x															x																		
*Problem solving						x	x												x					x		x	x			x				x					
*Platform / network														x		x						x	x																
Key partnerships																																							
*Optimisation and economy of scale		x																																					
*Reduction of risk and uncertainty																																							
*Acquisition of particular resources and activities																																							
Cost structure																																							
*Cost driven		x		x														x																		x		

Business Imperatives (section 4.1.1.)																																								
Nine building blocks of the business model canvas (section 3.4.3.)	**BI1**	**BI2**	**BI3**	**BI4**	**BI5**	**BI6**	**BI7**	**BI8**	**BI9**	**BI10**	**BI11**	**BI12**	**BI13**	**BI14**	**BI15**	**BI16**	**BI17**	**BI18**	**BI19**	**BI20**	**BI21**	**BI22**	**BI23**	**BI24**	**BI25**	**BI26**	**BI27**	**BI28**	**BI29**	**BI30**	**BI31**	**BI32**	**BI33**	**BI34**	**BI35**	**BI36**	**BI37**	**BI38**
*Value-driven			x			x																		x	x			x	x										

BI35: Business process is defined as “an inter-related set of cross-functional activities or events that result in the delivery of a specific product or service to a customer” by ISACA (n.d.). Therefore this business imperative can be linked to a company's business model in its entirety.

Appendix II: Extract from the COBIT 5 framework (ISACA, n.d.) and its related enabling processes and governance practices

The governance practices which could not be aligned to business imperatives or do not provide insight additional to the enabling process which was aligned to business imperatives in its entirety, were not included in this appendix. The specific areas aligned with business imperatives were highlighted by formatting the font as bold.

Area: Governance
Domain: Evaluate, Direct and Monitor

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
EDM01	Ensure Governance Framework Setting and Maintenance	Analyse and articulate the requirements for the governance of enterprise IT, and put in place and maintain effective enabling structures, principles, processes and practices, with clarity of responsibilities and authority to achieve the enterprise's mission, goals and objectives.	Provide a consistent approach integrated and aligned with the enterprise governance approach. To ensure that IT-related decisions are made in line with the enterprise's strategies and objectives, ensure that IT-related processes are overseen effectively and transparently, compliance with legal and regulatory requirements is confirmed, and the governance requirements for board members are met.			
EDM02	Ensure Benefits Delivery	**Optimise the value contribution to the business** from the business processes, IT services and IT assets resulting from	**Secure optimal value** from IT-enabled initiatives, services and assets; cost-efficient delivery of solutions and services; and a reliable and accurate picture of	EDM02.01	Evaluate value optimisation.	Continually evaluate the portfolio of IT-enabled investments, services and assets to determine the likelihood of **achieving enterprise objectives and delivering value at a reasonable cost.** Identify and make judgement on any changes in direction that need to be given to management to optimise value creation.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
		investments made by IT at acceptable costs.	costs and likely benefits so that business needs are supported effectively and efficiently.	EDM02.02	Direct value optimisation.	Direct value management principles and practices to **enable optimal value realisation** from IT-enabled investments throughout their full economic life cycle.
				EDM02.03	Monitor value optimisation.	Monitor the key goals and metrics to **determine the extent to which the business is generating the expected value and benefits to the enterprise** from IT-enabled investments and services. Identify significant issues and consider corrective actions.
EDM03	**Ensure Risk Optimisation**	Ensure that the enterprise's risk appetite and tolerance are understood, articulated and communicated, and that risk to enterprise value related to the use of IT is identified and managed.	Ensure that IT-related enterprise risk does not exceed risk appetite and risk tolerance, the impact of IT risk to enterprise value is identified and managed, and the potential for compliance failures is minimised.			
EDM04	**Ensure Resource Optimisation**	Ensure that adequate and sufficient IT-related capabilities (people, process and technology) are available to **support enterprise objectives effectively at optimal cost.**	Ensure that the resource needs of the enterprise are met in the optimal manner, IT costs are optimised, and there is an increased likelihood of benefit realisation and readiness for future change.	EDM04.01	Evaluate resource management.	Continually examine and make judgement on the current and future need for IT-related resources, options for resourcing (including sourcing strategies), and allocation and management principles to **meet the needs of the enterprise in the optimal manner.**
				EDM04.02	Direct resource management.	Ensure the adoption of resource management principles to enable **optimal use of IT resources** throughout their full economic life cycle.
				EDM04.03	Monitor resource management.	Monitor the key goals and metrics of the resource management processes and establish how deviations or problems will be identified, tracked and reported for remediation.
EDM05	**Ensure Stakeholder Transparency**	Ensure that enterprise IT performance and conformance measurement and **reporting are transparent**, with stakeholders approving the goals and metrics	Make sure that the communication to stakeholders is effective and timely and the basis for reporting is established to increase performance, identify areas for	EDM05.01	Evaluate stakeholder reporting requirements.	Continually examine and make judgement on the current and future requirements for s**takeholder communication and reporting**, including both mandatory reporting requirements (e.g., regulatory) and communication to other stakeholders. Establish the principles for communication.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
		and the necessary remedial actions.	improvement, and confirm that IT-related objectives and strategies are in line with the enterprise's strategy.	EDM05.02	Direct stakeholder communication and reporting.	Ensure the establishment of **effective stakeholder communication and reporting**, including mechanisms for ensuring the **quality and completeness of information**, oversight of mandatory reporting, and creating a communication strategy for stakeholders.
				EDM05.03	Monitor stakeholder communication.	Monitor the **effectiveness of stakeholder communication**. Assess mechanisms for ensuring **accuracy, reliability and effectiveness**, and ascertain whether the requirements of different stakeholders are met.

Area: Management
Domain: Align, Plan and Organise

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
APO01	Manage the IT Management Framework	Clarify and maintain the governance of enterprise IT mission and vision. Implement and maintain mechanisms and authorities to **manage information and the use of IT** in the enterprise in **support of governance objectives** in line with guiding principles and policies.	**Provide a consistent management approach to enable the enterprise governance requirements to be met, covering management processes, organisational structures, roles and responsibilities, reliable and repeatable activities, and skills and competencies.**	APO01.01	Define the organisational structure.	Establish an internal and extended organisational structure that reflects business needs and IT priorities. Put in place the required management structures (e.g., committees) that **enable management decision making** to take place in the most effective and efficient manner.
				APO01.02	Establish roles and responsibilities.	Establish, agree on and communicate roles and responsibilities of IT personnel, as well as other stakeholders with responsibilities for enterprise IT, that clearly reflect overall business needs and IT objectives and relevant personnel's authority, responsibilities and accountability.
				APO01.03	Maintain the enablers of the management system.	Maintain the enablers of the management system and control environment for enterprise IT, and ensure that they are **integrated and aligned with the enterprise's governance and management philosophy and operating style**. These enablers include the **clear communication** of expectations/requirements. The management system should encourage cross-divisional co-operation and teamwork, **promote compliance** and continuous improvement, and handle process deviations (including failure).
				APO01.04	Communicate management objectives and direction.	Communicate awareness and understanding of IT objectives and direction to appropriate stakeholders and users throughout the enterprise.
				APO01.05	Optimise the placement of the IT function.	**Position the IT capability in the overall organisational structure** to **reflect an enterprise model relevant to the importance of IT within the enterprise**, specifically its **criticality to enterprise strategy and the level of operational dependence on IT**. The reporting line of the CIO should be commensurate with the importance of IT within the enterprise.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				APO01.06	Define information (data) and system ownership.	Define and maintain **responsibilities for ownership of information (data) and information systems**. Ensure that owners make decisions about classifying **information and systems and protecting** them in line with this classification.
				APO01.07	Manage continual improvement of processes.	Assess, plan and execute the **continual improvement of processes** and their maturity to ensure that they are capable of delivering against enterprise, governance, management and control objectives. Consider COBIT process implementation guidance, emerging standards, **compliance requirements, automation opportunities, and the feedback of process users, the process team and other stakeholders.** Update the process and consider impacts on process enablers.
				APO01.08	Maintain compliance with policies and procedures.	Put in place procedures to maintain compliance with and performance measurement of policies and other enablers of the control framework, and enforce the consequences of non-compliance or inadequate performance. Track trends and performance and consider these in the future design and improvement of the control framework.
APO02	**Manage Strategy**	Provide a holistic view of the current business and IT environment, the future direction, and the initiatives required to migrate to the desired future environment. Leverage enterprise architecture building blocks and components, including externally provided services and related capabilities to **enable nimble, reliable and efficient response to strategic objectives.**	**Align strategic IT plans with business objectives.** Clearly communicate the objectives and associated accountabilities so they are understood by all, with the IT strategic options identified, structured and integrated with the business plans.			

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
APO03	Manage Enterprise Architecture	Establish a common architecture consisting of business process, information, data, application and technology architecture layers for effectively and efficiently realising enterprise and IT strategies by creating key models and practices that describe the baseline and target architectures. Define requirements for taxonomy, standards, guidelines, procedures, templates and tools, and provide a linkage for these components. **Improve alignment, increase agility, improve quality of information and generate potential cost savings** through initiatives such as re-use of building block components.	Represent the different building blocks that make up the enterprise and their inter-relationships as well as the principles guiding their design and evolution over time, enabling a standard, responsive and efficient **delivery of operational and strategic objectives**.	APO03.01	Develop the enterprise architecture vision.	The architecture vision provides a first-cut, high-level description of the baseline and target architectures, covering the business, information, data, application and technology domains. The architecture vision provides the sponsor with a key tool to sell the benefits of the proposed capability to stakeholders within the enterprise. The architecture vision describes how the new capability will meet enterprise goals and strategic objectives and address stakeholder concerns when implemented.
				APO03.02	Define reference architecture.	The reference architecture describes the current and target architectures for the business, information, data, application and technology domains.
				APO03.03	Select opportunities and solutions.	Rationalise the gaps between baseline and target architectures, taking both business and technical perspectives, and logically group them into project work packages. Integrate the project with any related IT-enabled investment programmes to ensure that the architectural initiatives are aligned with and enable these initiatives as part of overall enterprise change. Make this a collaborative effort with key enterprise stakeholders from business and IT to assess the enterprise's transformation readiness, and identify opportunities, solutions and all implementation constraints.
				APO03.04	Define architecture implementation.	Create a viable implementation and migration plan in alignment with the programme and project portfolios. Ensure that the plan is closely co-ordinated to ensure that value is delivered and the required resources are available to complete the necessary work.
				APO03.05	Provide enterprise architecture services.	The provision of enterprise architecture services within the enterprise includes guidance to and monitoring of implementation projects, formalising ways of working through architecture contracts, and measuring and communicating architecture's **value-add and compliance monitoring.**

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
APO04	**Manage Innovation**	Maintain an awareness of information technology and related service trends, **identify innovation opportunities**, and plan how to benefit from innovation in relation to business needs. Analyse what opportunities for **business innovation or improvement** can be created by emerging technologies, services or IT-enabled business innovation, as well as through existing established technologies and by **business and IT process innovation**. Influence strategic planning and enterprise architecture decisions.	Achieve **competitive advantage, business innovation, and improved operational effectiveness and efficiency** by exploiting information technology developments.	APO04.01	Create an environment conducive to innovation.	**Create an environment that is conducive to innovation**, considering issues such as culture, reward, collaboration, technology forums, and mechanisms to promote and capture employee ideas.
				APO04.02	Maintain an understanding of the enterprise environment.	Work with relevant stakeholders to understand their challenges. Maintain an adequate understanding of enterprise strategy and the competitive environment or other constraints so that **opportunities enabled by new technologies** can be identified.
				APO04.03	Monitor and scan the technology environment.	Perform systematic monitoring and scanning of the enterprise's external environment to identify emerging technologies that have the **potential to create value (e.g., by realising the enterprise strategy, optimising costs, avoiding obsolescence, and better enabling enterprise and IT processes)**. Monitor the marketplace, competitive landscape, industry sectors, and **legal and regulatory trends** to be able to analyse emerging technologies or **innovation ideas in the enterprise context**.
				APO04.04	Assess the potential of emerging technologies and innovation ideas.	Analyse identified emerging technologies and/or other IT innovation suggestions. Work with stakeholders to validate assumptions on the potential of new technologies and **innovation**.
				APO04.05	Recommend appropriate further initiatives.	Evaluate and monitor the results of proof-of-concept initiatives and, if favourable, generate recommendations for **further initiatives** and gain stakeholder support.
				APO04.06	Monitor the implementation and use of innovation.	Monitor the implementation and **use of emerging technologies and innovations during integration, adoption and for the full economic life cycle** to **ensure that the promised benefits are realised** and to identify lessons learned.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
APO05	Manage Portfolio	Execute the strategic direction set for investments **in line with the enterprise architecture vision** and the desired characteristics of the investment and related services portfolios, and consider the different categories of investments and the resources and funding constraints. Evaluate, prioritise and balance programmes and services, **managing demand within resource and funding constraints**, **based on their alignment with strategic objectives, enterprise worth and risk.** Move selected programmes into the active services portfolio for execution. Monitor the performance of the overall portfolio of services and programmes, proposing adjustments as necessary in response to programme and service performance or changing enterprise priorities.	**Optimise the performance** of the overall portfolio of programmes in response to programme and service **performance and changing enterprise priorities and demands**.			
APO06	Manage Budget and Costs	**Manage the IT-related financial activities** in both the **business and IT functions**, covering **budget, cost and benefit management, and prioritisation of spending** through the use of	Foster partnership between IT and enterprise stakeholders to enable the effective and efficient use of IT-related resources and **provide transparency and accountability of the cost and**	APO06.01	Manage finance and accounting.	Establish and maintain a method to **account for all IT-related costs, investments and depreciation** as an integral part of the enterprise financial systems and chart of accounts to **manage the investments and costs of IT**. Capture and allocate actual costs, analyse variances between forecasts and actual costs, and report using the enterprise's financial measurement systems.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
		formal budgeting practices and a fair and equitable system of allocating costs to the enterprise. Consult stakeholders to identify and **control the total costs and benefits** within the context of the IT strategic and tactical plans, and initiate corrective action where needed.	**business value** of solutions and services. Enable the enterprise to make informed decisions regarding the use of IT solutions and services.	APO06.02	Prioritise resource allocation.	Implement a decision-making process to **prioritise the allocation of resources** and rules for discretionary investments by individual business units. Include the potential use of external service providers and **consider the buy, develop and rent options**.
				APO06.03	Create and maintain budgets.	Prepare a budget reflecting the investment priorities supporting strategic objectives based on the portfolio of IT-enabled programmes and IT services.
				APO06.04	Model and allocate costs.	Establish and use an **IT costing model** based on the service definition, **ensuring that allocation of costs for services is identifiable, measurable and predictable**, to encourage the responsible use of resources including those provided by service providers. Regularly review and benchmark the **appropriateness of the cost/chargeback model to maintain its relevance and appropriateness to the evolving business and IT activitie**s.
				APO06.05	Manage costs.	Implement a **cost management process** comparing actual costs to budgets. **Costs should be monitored and reported** and, in the case of deviations, **identified in a timely manner** and their impact on enterprise processes and services assessed.
APO07	**Manage Human Resources**	Provide a structured approach to ensure optimal structuring, placement, decision rights and skills of human resources. This includes communicating the defined roles and responsibilities, learning and growth plans, and performance expectations, supported with competent and motivated people.	Optimise human resources capabilities to meet enterprise objectives.	APO07.01	Maintain adequate and appropriate staffing.	**Evaluate staffing requirements** on a regular basis or upon major changes to the enterprise or operational or IT environments to **ensure that the enterprise has sufficient human resources to support enterprise goals and objectives.** Staffing includes both internal and external resources.
				APO07.02	Identify key IT personnel.	Identify key IT personnel while minimising reliance on a single individual performing a critical job function through knowledge capture (documentation), knowledge sharing, succession planning and staff backup.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				APO07.03	Maintain the skills and competencies of personnel.	Define and manage the skills and competencies required of personnel. **Regularly verify that personnel have the competencies to fulfil their roles on the basis of their education, training and/or experience, and verify that these competencies are being maintained, using qualification and certification programmes where appropriate. Provide employees with ongoing learning and opportunities to maintain their knowledge, skills and competencies at a level required to achieve enterprise goals.**
				APO07.04	Evaluate employee job performance.	Perform timely performance evaluations on a regular basis against individual objectives derived from the enterprise's goals, established standards, specific job responsibilities, and the skills and competency framework. Employees should receive coaching on performance and conduct whenever appropriate.
				APO07.05	Plan and track the usage of IT and business human resources.	**Understand and track the current and future demand for business and IT human resources with responsibilities for enterprise IT.** Identify shortfalls and provide input into sourcing plans, enterprise and IT recruitment processes sourcing plans, and business and IT recruitment processes.
				APO07.06	Manage contract staff.	Ensure that consultants and contract personnel who support the enterprise with IT skills know and comply with the organisation's policies and meet agreed-on contractual requirements.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
APO08	Manage Relationships	**Manage the relationship between the business and IT** in a formalised and transparent way that ensures a f**ocus on achieving a common and shared goal of successful enterprise outcomes in support of strategic goals** and within the constraint of budgets and risk tolerance. Base the relationship on mutual trust, using open and understandable terms and common language and a willingness to take ownership and accountability for key decisions.	**Create improved outcomes, increased confidence, trust in IT and effective use of resources.**			
APO09	Manage Service Agreements	**Align IT-enabled services and service levels with enterprise needs and expectations,** including identification, specification, design, publishing, agreement, and monitoring of IT services, service levels and performance indicators.	Ensure that IT services and service levels **meet current and future enterprise needs.**			
APO10	Manage Suppliers	Manage IT-related services provided by all types of suppliers **to meet enterprise requirements**, including the selection of suppliers, management of relationships, management of contracts, and reviewing and monitoring of	**Minimise the risk associated with non-performing suppliers and ensure competitive pricing.**	APO10.01	Identify and evaluate supplier relationships and contracts.	Identify suppliers and associated contracts and categorise them into type, significance and criticality. Establish supplier and contract evaluation criteria and evaluate the overall portfolio of existing and alternative suppliers and contracts.
				APO10.02	Select suppliers.	Select suppliers according to a fair and formal practice to ensure a viable best fit based on specified requirements. Requirements should be optimised with input from potential suppliers.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
		supplier performance for effectiveness and compliance.		APO10.03	Manage supplier relationships and contracts.	Formalise and manage the supplier relationship for each supplier. Manage, maintain and monitor contracts and service delivery. **Ensure that new or changed contracts conform to enterprise standards and legal and regulatory requirements.** Deal with contractual disputes.
				APO10.04	Manage supplier risk.	Identify and manage risk relating to suppliers' ability to continually provide secure, efficient and effective service delivery.
				APO10.05	Monitor supplier performance and compliance.	Periodically review the overall performance of suppliers, compliance to contract requirements, and **value for money**, and address identified issues.
APO11	**Manage Quality**	**Define and communicate quality requirements in all processes, procedures and the related enterprise outcomes**, including controls, ongoing monitoring, and the use of proven practices and standards in continuous improvement and efficiency efforts.	**Ensure consistent delivery of solutions and services to meet the quality requirements of the enterprise** and satisfy stakeholder needs.	APO11.01	Establish a quality management system (QMS).	Establish and maintain a QMS that provides a standard, formal and continuous approach to **quality management for information, enabling technology and business processes that are aligned with business requirements and enterprise quality management**.
				APO11.02	Define and manage quality standards, practices and procedures.	Identify and maintain requirements, standards, procedures and practices for key processes to **guide the enterprise in meeting the intent of the agreed-on QMS.** This should be in line with the IT control framework requirements. Consider certification for key processes, organisational units, **products or services.**
				APO11.03	Focus quality management on customers.	**Focus quality management on customers** by determining their requirements and ensuring alignment with the quality management practices.
				APO11.04	Perform quality monitoring, control and reviews.	Monitor the quality of processes and services on an ongoing basis as defined by the QMS. Define, plan and **implement measurements to monitor customer satisfaction** with quality as well as the value the QMS provides. The information gathered should be used by the process owner to improve quality.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				APO11.05	Integrate quality management into solutions for development and service delivery.	Incorporate relevant quality management practices into the definition, monitoring, reporting and ongoing management of solutions development and service offerings.
				APO11.06	Maintain continuous improvement.	Maintain and regularly communicate an overall quality plan that promotes continuous improvement. This should include the need for, and benefits of, continuous improvement. **Collect and analyse data about the QMS, and improve its effectiveness.** Correct non-conformities to prevent recurrence. Promote a culture of quality and continual improvement.
APO12	**Manage Risk**	Continually identify, assess and reduce IT-related risk within levels of tolerance set by enterprise executive management.	Integrate the management of IT-related enterprise risk with overall ERM, and balance the costs and benefits of managing IT-related enterprise risk.			
APO13	**Manage Security**	Define, operate and monitor a system for **information security management.**	Keep the impact and occurrence of information security incidents within the enterprise's risk appetite levels.	APO13.01	Establish and maintain an ISMS.	Establish and maintain an ISMS that provides a standard, formal and continuous approach to **security management for information**, enabling secure technology and business processes that are **aligned with business requirements and enterprise security management.**
				APO13.02	Define and manage an information security risk treatment plan.	**Maintain an information security plan** that describes **how information security risk is to be managed and aligned with the enterprise strategy and enterprise architecture.** Ensure that recommendations for implementing security improvements are based on approved business cases and implemented as an integral part of services and solutions development, then operated as an integral part of business operation.
				APO13.03	Monitor and review the ISMS.	Maintain and regularly communicate the need for, and benefits of, **continuous information security improvement**. Collect and analyse data about the ISMS, and improve the effectiveness of the ISMS. Correct non-conformities to prevent recurrence. Promote a culture of security and continual improvement.

Area: Management
Domain: Build, Acquire and Implement

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
BAI01	Manage Programmes and Projects	Manage all programmes and projects from the investment portfolio in alignment with enterprise strategy and in a co-ordinated way. Initiate, plan, control, and execute programmes and projects, and close with a post-implementation review.	**Realise business benefits and reduce the risk of unexpected delays, costs and value erosion** by improving communications to and involvement of business and end users, ensuring the value and quality of project deliverables and maximising their contribution to the investment and services portfolio.	BAI01.01	Maintain a standard approach for programme and project management.	Maintain a standard approach for programme and project management that enables governance and management review and decision making and delivery management activities focussed on **achieving value and goals (requirements, risk, costs, schedule, quality) for the business in a consistent manner**.
				BAI01.02	Initiate a programme.	Initiate a programme to confirm the expected benefits and obtain authorisation to proceed. This includes agreeing on programme sponsorship, confirming the programme mandate through approval of the conceptual business case, appointing programme board or committee members, producing the programme brief, reviewing and updating the business case, developing a benefits realisation plan, and obtaining approval from sponsors to proceed.
				BAI01.03	Manage stakeholder engagement.	Manage stakeholder engagement to ensure an active exchange of **accurate, consistent and timely information** that reaches all relevant stakeholders. This includes planning, identifying and engaging stakeholders and managing their expectations.
				BAI01.04	Develop and maintain the programme plan.	Formulate a programme to lay the initial groundwork and to position it for successful execution by formalising the scope of the work to be accomplished and identifying the deliverables that will satisfy its goals and deliver value. Maintain and update the programme plan and business case throughout the full economic life cycle of the programme, ensuring alignment with strategic objectives and reflecting the current status and updated insights gained to date.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				BAI01.05	Launch and execute the programme.	Launch and execute the programme to acquire and direct the resources needed to accomplish the goals and benefits of the programme as defined in the programme plan. In accordance with stage-gate or release review criteria, prepare for stage-gate, iteration or release reviews to report on the progress of the programme and to be able to make the case for funding up to the following stage-gate or release review.
				BAI01.06	Monitor, control and report on the programme outcomes.	Monitor and control programme (solution delivery) and enterprise (value/outcome) performance against plan throughout the full economic life cycle of the investment. Report this performance to the programme steering committee and the sponsors.
				BAI01.07	Start up and initiate projects within a programme.	Define and document the nature and scope of the project to confirm and develop amongst stakeholders a common understanding of project scope and how it relates to other projects within the overall IT-enabled investment programme. The definition should be formally approved by the programme and project sponsors.
				BAI01.08	Plan projects.	Establish and maintain a formal, approved integrated project plan (covering business and IT resources) to guide project execution and control throughout the life of the project. The scope of projects should be clearly defined and tied to building or enhancing business capability.
				BAI01.09	Manage programme and project quality.	Prepare and execute a quality management plan, processes and practices, aligned with the QMS that describes the programme and project quality approach and how it will be implemented. The plan should be formally reviewed and agreed on by all parties concerned and then incorporated into the integrated programme and project plans.
				BAI01.10	Manage programme and project risk.	Eliminate or minimise specific risk associated with programmes and projects through a systematic process of planning, identifying, analysing, responding to, and monitoring and controlling the areas or events that have the potential to cause unwanted change. Risk faced by programme and project management should be established and centrally recorded.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				BAI01.11	Monitor and control projects.	Measure project performance against key project performance criteria such as schedule, quality, cost and risk. Identify any deviations from the expected. Assess the impact of deviations on the project and overall programme, and report results to key stakeholders.
				BAI01.12	Manage project resources and work packages.	Manage project work packages by placing formal requirements on authorising and accepting work packages, and assigning and co-ordinating appropriate business and IT resources.
				BAI01.13	Close a project or iteration.	At the end of each project, release or iteration, require the project stakeholders to ascertain whether the project, release or iteration delivered the planned results and value. Identify and communicate any outstanding activities required to achieve the planned results of the project and the benefits of the programme, and identify and document lessons learned for use on future projects, releases, iterations and programmes.
				BAI01.14	Close a programme.	Remove the programme from the active investment portfolio when there is agreement that the desired value has been achieved or when it is clear it will not be achieved within the value criteria set for the programme.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
BAI02	Manage Requirements Definition	**Identify solutions and analyse requirements before acquisition** or creation to **ensure that they are in line with enterprise strategic requirements covering business processes, applications, information/data, infrastructure and services. Co-ordinate with affected stakeholders** the review of feasible options including relative **costs and benefits**, risk analysis, and approval of requirements and proposed solutions.	Create feasible optimal solutions that meet enterprise needs while minimising risk.			
BAI03	Manage Solutions Identification and Build	Establish and maintain identified solutions in line with enterprise requirements covering design, development, procurement/sourcing and partnering with suppliers/vendors. Manage configuration, test preparation, testing, requirements **management and maintenance of business processes, applications, information/data, infrastructure and services.**	Establish timely and cost-effective solutions capable of supporting enterprise strategic and operational objectives.	BAI03.01	Design high-level solutions.	Develop and document high-level designs using agreed-on and appropriate phased or rapid agile development techniques. Ensure alignment with the IT strategy and enterprise architecture. Reassess and update the designs when significant issues occur during detailed design or building phases or as the solution evolves. Ensure that stakeholders actively participate in the design and approve each version.
				BAI03.02	Design detailed solution components.	Develop, document and elaborate detailed designs progressively using agreed-on and appropriate phased or rapid agile development techniques, **addressing all components (business processes and related automated and manual controls, supporting IT applications, infrastructure services and technology products, and partners/suppliers)**. Ensure that the detailed design includes internal and external SLAs and OLAs.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				BAI03.03	Develop solution components.	Develop solution components progressively in accordance with detailed designs following development methods and documentation standards, quality assurance (QA) requirements, and approval standards. Ensure that all control requirements in the business processes, supporting IT applications and infrastructure services, services and technology products, and partners/suppliers are addressed.
				BAI03.04	Procure solution components.	Procure solution components based on the acquisition plan in accordance with requirements and detailed designs, architecture principles and standards, and the enterprise's overall procurement and contract procedures, QA requirements, and approval standards. Ensure that all legal and contractual requirements are identified and addressed by the supplier.
				BAI03.05	Build solutions.	**Install and configure solutions and integrate with business process activities.** Implement control, security and auditability measures during configuration, and during integration of hardware and infrastructural software, to protect resources and **ensure availability and data integrity.** Update the services catalogue to reflect the new solutions.
				BAI03.06	Perform quality assurance.	Develop, resource and execute a QA plan aligned with the QMS to obtain the quality specified in the requirements definition and the enterprise's quality policies and procedures.
				BAI03.07	Prepare for solution testing.	Establish a test plan and required environments to test the individual and integrated solution components, including the business processes and supporting services, applications and infrastructure.
				BAI03.08	Execute solution testing.	Execute testing continually during development, including control testing, in accordance with the defined test plan and development practices in the appropriate environment. Engage business process owners and end users in the test team. Identify, log and prioritise errors and issues identified during testing.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				BAI03.09	Manage changes to requirements.	Track the status of individual requirements (including all rejected requirements) throughout the project life cycle and manage the approval of changes to requirements.
				BAI03.10	Maintain solutions.	Develop and execute a plan for the maintenance of solution and infrastructure components. Include periodic reviews against business needs and operational requirements.
				BAI03.11	Define IT services and maintain the service portfolio.	Define and agree on new or changed IT services and service level options. Document new or changed service definitions and service level options to be updated in the services portfolio.
BAI04	Manage Availability and Capacity	Balance current and future needs for **availability, performance and capacity with cost-effective service provision**. Include assessment of current capabilities, forecasting of future needs based on business requirements, analysis of business impacts, and assessment of risk to plan and implement actions to meet the identified requirements.	Maintain service availability, efficient management of resources, and optimisation of system performance through prediction of future performance and capacity requirements.	BAI04.01	Assess current availability, performance and capacity and create a baseline.	Assess availability, performance and capacity of services and resources to ensure that cost-justifiable capacity and performance are available to support business needs and deliver against SLAs. **Create availability, performance and capacity baselines for future comparison.**
				BAI04.02	Assess business impact.	Identify important services to the enterprise, map services and resources to business processes, and identify business dependencies. **Ensure that the impact of unavailable resources is fully agreed on and accepted by the customer.** Ensure that, for vital business functions, the SLA availability requirements can be satisfied.
				BAI04.03	Plan for new or changed service requirements.	**Plan and prioritise availability, performance and capacity implications of changing business needs and service requirements.**
				BAI04.04	Monitor and review availability and capacity.	**Monitor, measure, analyse, report and review availability, performance and capacity.** Identify deviations from established baselines. Review trend analysis reports identifying any significant issues and variances, initiating actions where necessary, and ensuring that all outstanding issues are followed up.
				BAI04.05	Investigate and address availability, performance and capacity issues.	**Address deviations by investigating and resolving identified availability, performance and capacity issues.**

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
BAI05	**Manage Organisational Change Enablement**	**Maximise the likelihood of successfully implementing sustainable enterprise-wide organisational change quickly and with reduced risk, covering the complete life cycle of the change and all affected stakeholders in the business and IT.**	Prepare and commit stakeholders for **business change** and reduce the risk of failure.			
BAI06	**Manage Changes**	**Manage all changes in a controlled manner**, including standard changes and emergency maintenance relating to business processes, applications and infrastructure. This includes change standards and procedures, impact assessment, prioritisation and authorisation, emergency changes, tracking, reporting, closure and documentation.	**Enable fast and reliable delivery of change to the business** and mitigation of the risk of negatively impacting the stability or integrity of the changed environment.			
BAI07	**Manage Change Acceptance and Transitioning**	**Formally accept and make operational new solutions**, including implementation planning, system and data conversion, acceptance testing, communication, release preparation, promotion to production of **new or changed business processes and IT services**, early production support, and a post-implementation review.	Implement solutions safely and in line with the agreed-on expectations and outcomes.			

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
BAI08	**Manage Knowledge**	**Maintain the availability of relevant, current, validated and reliable knowledge to support all process activities and to facilitate decision making.** Plan for the identification, gathering, organising, maintaining, use and retirement of knowledge.	Provide the knowledge required to support all staff in their work activities and for informed decision making and **enhanced productivity.**	BAI08.01	Nurture and facilitate a knowledge-sharing culture.	Devise and implement a scheme to **nurture and facilitate a knowledge-sharing culture.**
				BAI08.02	Identify and classify sources of information.	**Identify, validate and classify diverse sources of internal and external information** required to enable effective use and operation of business processes and IT services.
				BAI08.03	Organise and contextualise information into knowledge.	Organise information based on classification criteria. **Identify and create meaningful relationships between information elements and enable use of information.** Identify owners and define and implement levels of access to knowledge resources.
				BAI08.04	Use and share knowledge.	**Propagate available knowledge resources to relevant stakeholders and communicate how these resources can be used to address different needs** (e.g., problem solving, learning, strategic planning and decision making).
				BAI08.05	Evaluate and retire information.	**Measure the use and evaluate the currency and relevance of information.** Retire obsolete information.
BAI09	**Manage Assets**	Manage IT assets through their life cycle to make sure that their use **delivers value at optimal cost**, they **remain operational (fit for purpose)**, they are accounted for and physically protected, and those assets that are critical to support service capability are reliable and available. Manage software licences to ensure that the optimal number are acquired, retained and deployed in relation to required business usage, and the software installed is in	Account for all IT assets and **optimise the value** provided by these assets.	BAI09.01	Identify and record current assets.	Maintain an up-to-date and accurate record of all IT assets required to deliver services and ensure alignment with configuration management and financial management.
				BAI09.02	Manage critical assets.	Identify assets that are critical in providing service capability and take steps to maximise their reliability and availability to support business needs.
				BAI09.03	Manage the asset life cycle.	Manage assets from procurement to disposal to ensure that assets are utilised as effectively and efficiently as possible and are accounted for and physically protected.
				BAI09.04	Optimise asset costs.	Regularly review the overall asset base to identify ways to **optimise costs and maintain alignment with business needs**.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
		compliance with licence agreements.		BAI09.05	Manage licences.	Manage software licences so that the optimal number of licences is maintained to support business requirements and the number of licences owned is sufficient to cover the installed software in use.
BAI10	Manage Configuration	Define and maintain descriptions and relationships between key resources and capabilities required to deliver IT-enabled services, including collecting configuration information, establishing baselines, verifying and auditing configuration information, and updating the configuration repository.	Provide sufficient information about service assets to enable the service to be effectively managed, assess the impact of changes and deal with service incidents.			

Area: Governance
Domain: Deliver, Service and Support

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
DSS01	Manage Operations	Co-ordinate and execute the activities and operational procedures required to deliver internal and outsourced IT services, including the execution of pre-defined standard operating procedures and the required monitoring activities.	Deliver IT operational service outcomes as planned.			
DSS02	Manage Service Requests and	**Provide timely and effective response to user requests** and resolution of all types of incidents. Restore normal service; record and fulfil user requests; and record, investigate, diagnose, escalate and resolve incidents.	**Achieve increased productivity and minimise disruptions through quick resolution of user queries and incidents.**			
DSS03	Manage Problems	Identify and classify problems and their root causes and **provide timely resolution to prevent recurring incidents.** Provide recommendations for improvements.	**Increase availability, improve service levels, reduce costs, and improve customer convenience and satisfaction by reducing the number of operational problems.**			

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
DSS04	Manage Continuity	Establish and maintain a plan to **enable the business and IT to respond to incidents and disruptions in order to continue operation of critical business processes** and required IT services and **maintain availability of information** at a level acceptable to the enterprise.	Continue critical business operations and maintain availability of information at a level acceptable to the enterprise in the event of a significant disruption.			
DSS05	Manage Security Services	**Protect enterprise information to maintain the level of information security risk acceptable** to the enterprise in accordance with the security policy. Establish and maintain **information security** roles and access privileges and perform security monitoring.	Minimise the business impact of operational information security vulnerabilities and incidents.	DSS05.01	Protect against malware.	Implement and maintain preventive, detective and corrective measures in place (especially up-to-date security patches and virus control) across the enterprise to **protect information systems and technology from malware** (e.g., viruses, worms, spyware, spam).
				DSS05.02	Manage network and connectivity security.	Use security measures and related management procedures to **protect information over all methods of connectivity.**
				DSS05.03	Manage endpoint security.	Ensure that endpoints (e.g., laptop, desktop, server, and other mobile and network devices or software) are secured at a level that is equal to or greater than the defined **security requirements of the information processed, stored or transmitted.**
				DSS05.04	Manage user identity and logical access.	**Ensure that all users have information access rights in accordance with their business requirements** and co-ordinate with business units that manage their own access rights within business processes.
				DSS05.05	Manage physical access to IT assets.	Define and implement procedures to grant, limit and revoke access to premises, buildings and areas according to business needs, including emergencies. Access to premises, buildings and areas should be justified, authorised, logged and monitored. This should apply to all persons entering the premises, including staff, temporary staff, clients, vendors, visitors or any other third party.

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				DSS05.06	Manage sensitive documents and output devices.	Establish appropriate **physical safeguards, accounting practices and inventory management over sensitive IT assets**, such as special forms, negotiable instruments, special-purpose printers or security tokens.
				DSS05.07	Monitor the infrastructure for security-related events.	Using intrusion detection tools, **monitor the infrastructure for unauthorised access** and ensure that any events are integrated with general event monitoring and incident management.
DSS06	**Manage Business Process Controls**	Define and maintain appropriate **business process controls to ensure that information** related to and processed by in-house or outsourced business processes **satisfies all relevant information control requirements.** Identify the relevant information control requirements and manage and operate adequate controls to ensure that information and information processing satisfy these requirements.	**Maintain information integrity and the security of information assets handled within business processes in the enterprise or outsourced.**	DSS06.01	Align control activities embedded in business processes with enterprise objectives.	Continually assess and monitor the execution of the business process activities and related controls, based on enterprise risk, to **ensure that the processing controls are aligned with business needs.**
				DSS06.02	Control the processing of information.	**Operate the execution of the business process activities and related controls**, based on enterprise risk, **to ensure that information processing is valid, complete, accurate, timely, and secure** (i.e., reflects legitimate and authorised business use).
				DSS06.03	Manage roles, responsibilities, access privileges and levels of authority.	Manage the business roles, responsibilities, levels of authority and segregation of duties needed to **support the business process objectives**. **Authorise access to any information assets related to business information processes**, including those under the custody of the business, IT and third parties. This ensures that the business knows where the data are and who is handling data on its behalf.
				DSS06.04	Manage errors and exceptions.	**Manage business process exceptions and errors and facilitate their correction.** Include escalation of business process errors and exceptions and the execution of defined corrective actions. **This provides assurance of the accuracy and integrity of the business information process.**

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				DSS06.05	Ensure traceability of information events and accountabilities.	**Ensure that business information can be traced to the originating business event and accountable parties.** This enables **traceability of the information through its life cycle and related processes.** This provides assurance that information that drives the business is reliable and has been **processed in accordance with defined objectives.**
				DSS06.06	Secure information assets.	**Secure information assets accessible by the business** through approved methods, including information in electronic form (such as methods that create new assets in any form, portable media devices, user applications and storage devices), **information in physical form** (such as source documents or output reports) **and information during transit. This benefits the business by providing end-to-end safeguarding of information.**

Area: Governance
Domain: Monitor, Evaluate and Assess

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
MEA01	Monitor, Evaluate and Assess Performance and Conformance	Collect, validate and evaluate business, IT and process goals and metrics. Monitor that processes are performing against agreed-on performance and conformance goals and metrics and provide reporting that is systematic and timely.	Provide transparency of performance and conformance and drive achievement of goals.			
MEA02	Monitor, Evaluate and Assess the System of Internal Control	Continuously monitor and evaluate the control environment, including self-assessments and independent assurance reviews. Enable management to identify control deficiencies and inefficiencies and to initiate improvement actions. Plan, organise and maintain standards for internal control assessment and assurance activities.	Obtain transparency for key stakeholders on the adequacy of the system of internal controls and thus provide trust in operations, confidence in the achievement of enterprise objectives and an adequate understanding of residual risk.			
MEA03	Monitor, Evaluate and Assess Compliance with External Requirements	Evaluate that IT processes and IT-supported business processes are compliant with laws, regulations and contractual requirements. Obtain assurance that the requirements have been identified and complied with, **and integrate IT compliance with overall enterprise compliance.**	**Ensure that the enterprise is compliant with all applicable external requirements.**	MEA03.01	Identify external compliance requirements.	On a continuous basis, identify and monitor for changes in **local and international laws, regulations and other external requirements that must be complied with from an IT perspective.**

Process ID	Process	Process Description	Process Purpose Statement	Practice ID	Practice Name	Governance Practice
				MEA03.02	Optimise response to external requirements.	Review and adjust policies, principles, standards, procedures and methodologies **to ensure that legal, regulatory and contractual requirements are addressed and communicated. Consider industry standards, codes of good practice, and best practice guidance for adoption and adaptation.**
				MEA03.03	Confirm external compliance.	**Confirm compliance of policies, principles, standards, procedures and methodologies with legal, regulatory and contractual requirements.**
				MEA03.04	Obtain assurance of external compliance.	**Obtain and report assurance of compliance and adherence with policies, principles, standards, procedures and methodologies. Confirm that corrective actions to address compliance gaps are closed in a timely manner.**

Appendix III: Alignment of business imperatives with the COBIT 5

	Business Imperatives (section 4.1.1.)																																				
COBIT 5 Domains, Enabling Processes and Governance Practices (Appendix II)	**BI1**	**BI2**	**BI3**	**BI4**	**BI5**	**BI6**	**BI7**	**BI8**	**BI9**	**BI10**	**BI11**	**BI12**	**BI13**	**BI14**	**BI15**	**BI16**	**BI17**	**BI18**	**BI19**	**BI20**	**BI21**	**BI22**	**BI23**	**BI24**	**BI25**	**BI26**	**BI27**	**BI28**	**BI29**	**BI30**	**BI31**	**BI32**	**BI33**	**BI34**	**BI35**	**BI36**	**BI37**	**BI38**
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*BI3: The business imperative called "High profitability through added value" refers specifically to creating a product or service of a superior quality than its competitors. Even though the COBIT 5 processes add value to the business by aligning various functions of the IT departments with business objectives, it cannot be mapped directly to this specific business imperative. It could, however, improve the quality of the company's product or services indirectly by supporting the business objectives. This business imperative can therefore be mapped to COBIT 5.

Appendix IV: A list of potential business requirements which could assist companies in achieving its business imperatives

1) **Control and protection of sensitive information:** The control and protection of sensitive information is of utmost importance in highly regulated sectors (Boshoff, 2014). Ensuring the confidentiality, accuracy, validity and integrity of information is imperative for companies in these industries.
2) **Low cost base and focus on value-added activities:** The fixed costs of the company need to be kept to a minimum and companies should spend less time and money on non-value adding activities (Drury, 2015:569). According to the 2015 global CIO survey 37% of its participants indicated that reducing IT costs and improving efficiency is one of the company's top three technology priorities for the year ahead (Kark *et al.*, 2015:54).
3) **Reliable information** is needed for decision making. According to Goosen and Rudman (2013:97) real-time access to information, and integrated applications with which the information is processed and stored by, is required to enable analysis of information relating to customers, financial aspects of the company and other information. 23% of the participants of the 2015 global CIO survey indicated that providing timely and relevant information to business stakeholders is one of the company's top three technology priorities for the 12 months following the survey (Kark *et al.*, 2015:54). This highlights the importance of reliable information as discussed by Goosen and Rudman (2013:97). The Global Management Accounting Principles released by the Chartered Global Management Accountant (CGMA, 2014:10), a joint venture formed by AICPA and CIMA, echoes this statement by reporting that relevant information needs to be made available to the decision-makers in a company on a timely basis. The principles underlying to relevant information is the identification, collection, validation, preparation and storage of information. The reliability of information depends on the timeliness, accuracy, quality and consistency of information used for decision making (CGMA, 2014:10). Furthermore the company should have immediate real-time access to financial and non-financial information in order to facilitate the decision-making process and early warning systems should be in place if corrective action should be required (CGMA, 2014:21). According to Goosen and Rudman (2013:97) the reliability of information regarding costing is of particular importance in manufacturing environments to ensure that costs are managed effectively. Drury (2015:564) echoes this sentiment by stating that cost drivers should be established and the cost related to these drivers should be monitored against budget. This will give senior management a clear indication of the cost drivers whose usage can be reduced in order to reduce the related costs. Drury (2015:576) also states that the

availability of information relating to the quality of a company's products and services, as well as the process of producing these products or services, is critical in enabling total quality management.

4) **Increased efficiency** in the operations of the company. According to Drury (2015:14) more time needs to be spent on value-added activities instead of dedicating resources to non-value-added activities.
5) **Adaptability and flexibility:** The company should be able to adapt to the demands of customers, which requires adaptability and flexibility in a company (Boshoff, 2014).
6) **On time deliver:** Reliability of products and services includes on time delivery of services and products if delivery is the responsibility of the company (Drury, 2015:14).
7) **Quality management and improvement** will lead to significant cost savings and ultimately increased profitability (Drury, 2015:576).
8) **Back-ups and a contingency plan:** Regular back-ups should be made and a contingency plan should be in place in case of loss of data or processed information. Refer to point 3 for the importance of the availability of reliable information.
9) **Automation of business processes** can lead to increased productivity and efficiency (Boshoff, 2014). Hernaus *et al.* (2016:186) found that business processes which are managed effectively enables senior management to successfully realise a company's business objectives. 46% of the participants of the 2015 global CIO survey indicated that the improvement of existing business processes is one of the company's top three technology priorities for the 12 months following the survey (Kark *et al.*, 2015:54).
10) **Minimising the cycle time:** According to Drury (2015:569) companies need to minimise the cycle time of delivering its products or services and focus its time on activities which add value to the product. By eliminating non-value-added activities a company permanently reduces the costs related to those activities, without compromising the value of the product or service (Drury, 2015:569-570).
11) **Customers should experience the brand** exactly the same regardless of the location of the store or staff member they interact with. Therefore replication should ensure consistency between various locations. The company will require all of the locations to be equipped with the same hardware and software to enable standard use by all employees (Boshoff, 2014). This will enable employees to transfer between locations seamlessly.
12) **Aggregation and consolidation of data:** Transactions and other data initiated and recorded across various stores should be aggregated and consolidated on a timely basis. According to CGMA (2014:19) data and information need to be comprehensive at all times in order for any user to access the information needed to perform tasks or review the work done by others.

13) **Knowledge sharing:** Communication and the decision making process is critical to the successful completion of projects (Bard, 2015:13; Boshoff, 2014).
14) **Mobile access:** End-users (the employees) require mobile access to websites and databases in order to carry out their duties at various locations (Boshoff, 2014).
15) **Strong security measures** need to be implemented on devices and systems, which will ensure that only authorised users gain access to the system and the information processed by the system (Boshoff, 2014).
16) **Sharing of information by means of a central server:** Where the database is on a central server it is important that the information is shared in order for collaboration to take place between various locations and the company head office. According to Goman (2016) encouraging the sharing of knowledge is essential in achieving collaboration and could contribute to the success of a company.
17) **Enterprise Application Integration:** Real-time sharing of information at an integrated level between the company and the following external parties are required:
    - Suppliers and production teams;
    - Customers; and
    - Employees and management, from different levels of employment, who might be positioned at various locations and work for various companies within a group of companies.

    This real-time sharing of information at an integrated level is referred to as Enterprise Application Integration (EAI) and it enables a company to manage relationships between various parties and across multiple applications (Goosen & Rudman, 2013:98).
18) **Low level of skills required:** Where the job specifications of the staff compliment comprise of basic, routine-based tasks (such as operating a point-of-sale terminal) a low level of skills will be required and unskilled or semi-skilled workforces will be sufficient to fulfil this role. In an e-commerce environment customers are required to use companies' systems without relevant training (Goosen & Rudman, 2013:97).
19) **Minimum staff involvement** should be required in order for customers to perform certain actions independently. According to Scherer *et al.* (2015:197) value, in the context of self-service, is created by a combination of the customers' skill sets and the company's resources. The company's knowledge therefore needs to be embedded in the self-service platform they provide and the design should be user friendly for customers with a low skill sets (Scherer *et al.*, 2015:197).
20) **De-skilling operations**: In an environment where the company can only afford staff with low level of skills, the level of skills required to carry out certain operations need to be

reduced to enable staff members with a low level of skills to perform the required tasks (Boshoff, 2014).

21) **Efficient workflow** is required in environments where the staff members are required to work at maximum capacity and perform tasks in the most effective and efficient manner (Boshoff, 2014).
22) **Little or no downtime or outages of the system:** Periods during which systems are unavailable or fail to perform its primary function will most likely lead to a loss in profits for the company. Therefore it is of utmost importance that little or no downtime or outages of the system should occur (Boshoff, 2014).
23) **Secure access:** End-users, including customers and employees, need to obtain secure access, potentially via hotspot connections, to the company's website and / or e-commerce platform via their mobile devices (García, 2013:8).
24) **Tailored interaction:** Customers' behaviour, wants and needs have to be monitored if the company wishes to tailor its interaction with or target marketing towards certain customers or groups of customers. If the company aims to create a need or desire amongst its customers, marketing campaigns should be adapted to educate customers about the advantages of supporting a particular company as opposed to its competitors (Dowling, 2004:266).
25) **Effective and efficient platform:** According to Scherer *et al.* (2015:178) self-service channels are known to increases productivity in companies. In order to deliver on the expectation of increased productivity and to improve customer service, e-commerce platforms need to be effective and efficient. The same applies to the process employed at traditional point-of-sale terminals.
26) **Central database:** As it is necessary for skills and knowledge to be shared amongst employees, the shared information, which constitutes knowledge in the company, will have to be stored on a central database in order for all authorised employees to access when needed (Boshoff, 2014).
27) **Enablement:** Cohesiveness, and therefore knowledge sharing (see point 13), amongst team members is extremely important in high performance teams (Molnau, n.d.). According to Boshoff (2014) high performance teams need to be able to work as effectively and efficiently as possible. A survey conducted by EY (n.d.) reflected that in order for teams to work well together team members should be empowered to be autonomous and make their own decisions on a day-to-day basis.
28) **Information about customers:** The company should gather information about its customers, their behaviour and perceptions about the company's products and services

in order to better meet the needs of the customers by adapting the services it delivers or determine how products should be developed (Boshoff, 2014; Brown, 2012).

29) **Adapting to customer needs:** Companies have to adapt to changing customer needs in terms of the products and services the company produces or delivers, the economic environment and the market it operates in (Briggs, 2015:36). According to Briggs (2015:36) the gathering and analysis of relevant data can assist senior management to better understand the company's customers, markets and products.
30) **Adaptability of employees and importance of employee decisions:** With the evolution of automation human intervention will be limited to the minimum and the decisions made by employees will carry a lot of weight. Employees will also be required to be more adaptable as technology and automation develops (Pulakos *et al.*, 2000:612).

Appendix V: Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives, together with the component of IT architecture which will be affected

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:	**The component of IT architecture which will be affected (refer to section 3.6):**
i. The information system and applications used in processing sensitive information should contain **embedded controls** around all relevant components of the access paths used for the processing of sensitive information. This will ensure that the control objectives of confidentiality, privacy, integrity and accuracy are achieved (Boshoff, 2014).	Application Plan: - application architecture Infrastructure Architecture: - processing of information
ii. The information technology hardware and software as well as applications used by the company are required to be **low in cost** and therefore not result in regular and/or high operational or capital expenditure. The hardware, software and applications should be **scalable** (Boshoff, 2014), which is defined by Gartner (n.d.) as "the measure of a system's ability to increase or decrease in performance and cost in response to changes in application and system processing demands".	Application Plan: - application architecture - hardware and software Infrastructure Architecture: - processing of information
iii. IT systems and the related investment need to be monitored for **cost versus benefit**; systems need to be developed or acquired based on their **value added** to the organisation taking into account the other business imperatives identified. It is important that an appropriate IT system is installed to prevent re-installation of a new system. The cost of ownership of the IT systems (fixed costs of IT hardware and software) should make business sense, i.e. the value added (benefits) from investments in scalable IT systems should exceed the cost of ownership.	Overall IT architecture
iv. **Management information systems** and the applications used to process information, should be **reliable** and approved by the relevant business users and be appropriate to support business decisions (CGMA, 2014:23).	Application Plan: - application architecture; - data and information

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:		**The component of IT architecture which will be affected (refer to section 3.6):**
		<u>Infrastructure Architecture:</u> - processing of information
v.	The application used should deliver **real-time** information, by means of *inter alia* reliable enterprise resource planning (ERP) system (refer to xiii) and workflow management (refer to xiv). Real-time processing of information refers to the ability of an online system to update files on a computer as soon as a transaction is initiated through a terminal (ISACA, n.d.);	<u>Application Plan:</u> - application architecture; - data and information <u>Infrastructure Architecture:</u> - processing of information
vi.	The application used should increase efficiency by means of automation. According to Boshoff (2014) rule driven **Online Transacting Processing (OLTP)** will assist senior management in operating more effectively and efficiently. According to Gartner (n.d.) OLTP refers to transaction processing characterised by high availability and quick response times as requests need to be responded to in a turnaround time approximating real-time. Online terminals ensure the instant updating of the relevant database during the processing of transactions (Gartner, n.d.). OLTP is mostly used by companies in industries which are dependent on the efficient processing of high volumes of transactions.	<u>Application Plan:</u> - application architecture; - office automation; - data and information <u>Infrastructure Architecture:</u> - processing of information; - network infrastructure
vii.	IT systems and applications should be **adaptable and flexible** in order to accommodate diverse products and / or services delivered by the company. Each product or service line might require unique costing systems or calculations, which should be supported by the systems and applications (Goosen & Rudman, 2013:97).	<u>Application Plan:</u> - application architecture; - hardware and software
viii.	The systems and applications should be able to **handle atypical tasks and developments** in the business (Goosen & Rudman, 2013:97).	<u>Application Plan:</u> - application architecture
ix.	A **robust system**, which delivers consistent high-level performance for a wide range of changing conditions, including unexpected incidents, is needed as this will **eliminate down-time of a system** (Boshoff, 2014).	<u>Application Plan:</u> - hardware and software

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:	**The component of IT architecture which will be affected (refer to section 3.6):**
x. **Redundancy**, which is defined by Gartner (n.d.) as the "provision of duplicate, backup equipment or links that immediately take over the function of equipment or transmission lines that fail" is of critical importance to avoid corrupt data or the loss of data / information (Boshoff, 2014). Cloud-based back-ups should be made on a regular basis.	Application Plan: - hardware and software
xi. **Uninterruptible power supply (UPS)** provides immediate power to the system or equipment in case of power failure. According to Techopedia (n.d.) a UPS "ensures uninterruptible power to computers, data centres or other electrically powered equipment during an unexpected power failure".	Application Plan: - hardware and software
xii. **Specialised integrated applications** are required to produce real-time information and customer reports such as ratio analysis against industry standards and inventory management reports (Boshoff, 2014).	Application Plan: - application architecture; - office automation Infrastructure Architecture: - network infrastructure; - integration
xiii. An information system allowing for real-time aggregation and consolidation of financial data is needed to provide management with a single view of financial data at any time. A **reliable enterprise resource planning (ERP) system** ensures an integrated real-time view of the core business processes, including financial and management reports. According to ISACA (n.d.) business process integrity is ensured by an ERP system, which supports controls over business processes.	Application Plan: - application architecture; - office automation Infrastructure Architecture: - processing of information; - network infrastructure; - integration
xiv. According to Gartner (n.d.) there are two types of **workflow management**: • Internal and external process integration: a workflow approach that allows for the definition of business processes across various applications. This usually requires a standards-based workflow development environment.	Application Plan: - application architecture; - office automation Infrastructure Architecture:

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:		**The component of IT architecture which will be affected (refer to section 3.6):**
•	<u>Automated events or processes:</u> a workflow approach that enables automated tasks (e.g. the automation of steps in a procurement process, marketing campaign or sales process) to be performed. Both types of workflow management are required to utilise resources effectively. Business process applications used for, *inter alia,* the management of inventory and financial reporting should have a fully automated integration system to facilitate seamless integration of information. Workflow automation will increase productivity in a company as it will minimise processing time and result in the productive use of resources.	- processing of information; - network infrastructure; - integration
xv.	The **application software** used by employees should have a **uniform design** and be implemented at the various locations as a replica of the original application (Goosen & Rudman, 2013:98). This will standardise training of employees, enable these employees to work at any branch of the company and assist senior management in assisting staff members with queries surrounding the application software even when the managers are off site (Boshoff, 2014).	<u>Application Plan:</u> - application architecture
xvi.	According to Sheldon and Big Sur Multimedia (n.d.) **collaborative computing** "allows users to work together on documents and projects, usually in real time, by taking advantage of underlying network communication systems." According to Boshoff (2014) a network of data needs to be updated in real-time and a sophisticated software package therefore needs to be implemented and communication protocols configured to ensure collaborative commerce. Examples of collaborative computing includes application suites such as Microsoft Office and Exchange, video conferencing applications which allow users to collaborate over local networks, private wide area networks (WANs) or the internet, internet collaboration tools to facilitate *inter alia* virtual meetings, instant messaging tools as well as workflow management tools which coordinates the flow of documents within a company (Sheldon & Big Sur Multimedia, n.d.).	<u>Infrastructure Architecture:</u> - network infrastructure; - integration

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:		**The component of IT architecture which will be affected (refer to section 3.6):**
xvii.	**Ubiquitous computing** refers to electronic devices which are connected in order to communicate information. Devices that use ubiquitous computing are therefore completely connected and have continuous availability (Techopedia, n.d.). According to Boshoff (2014) ubiquitous applications should be used to share information when employees are required to work from various locations as it enables computing to take place using any mobile device in any location and in any format.	Application Plan: - application architecture Infrastructure Architecture: - processing of information; - network infrastructure; - integration
xviii.	According to Boshoff (2014) the mobile devices employees are working on should have a **reliable connection** to the internet, with a virtual private network (VPN). Data protection software should be loaded on the device and access rights should be configured in order to only allow authorised users access to the company's system and information (Boshoff, 2014).	Application Plan: - Data and information Infrastructure Architecture: - network infrastructure
xix.	Software which is **compatible** with the company's system outlay should be installed on mobile devices used by employees and the type of hardware used should support remote access to the company's system (Boshoff, 2014).	Application Plan: - hardware and software
xx.	According to Goman (2016) companies should create knowledge-sharing opportunities for team members to enhance collaboration amongst team members. Companies should share a **database located on a server at head-office** with a high speed, secure connection, with a VPN to enable information sharing between various locations.	Application Plan: - application architecture Infrastructure Architecture: - network infrastructure; - integration Application Integration Plan
xxi.	According to Goosen and Rudman (2013:98) collaboration between a company and its customers should be enabled by a **Customer Relationship Management** (CRM) system and interaction between a company and its suppliers and production teams requires a **Supply Chain Management** (SCM) system.	Infrastructure Architecture: - network infrastructure

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:		**The component of IT architecture which will be affected (refer to section 3.6):**
xxii.	**User-friendly interfaces and basic workflows** in the application architecture should facilitate and coordinate basic sets of actions which could be followed by someone with a low skills set, including employees and customers such as in the case of e-commerce. Work stations should, for example, be easy to access, understand and use (Boshoff, 2014; Goosen & Rudman, 2013:97). According to Briggs *et al.* (2016:18) IT solutions should be designed by focussing on the user and the usability of solutions should be at the core of IT projects. This will lead to simplified applications, which is of high importance to numerous companies (Kark *et al.*, 2015:54).	Application Plan: - application architecture
xxiii.	**Highly automated** applications should allow for seamless and efficient interaction with the end-user (Boshoff, 2014).	Application Plan: - application architecture - office automation
xxiv.	**Connectivity** between the various elements of the access path **and high processing speed** of the IT systems will enable high output levels (Boshoff, 2014).	Infrastructure Architecture: - processing of information; - network infrastructure
xxv.	The applications used for mobile connection should be **compatible** with mobile devices and **data protection software** should be installed to maintain a secure connection by customers. According to a study conducted by Xu, Peak and Prybutok (2015:173 & 181) users of mobile applications are concerned with quality issues such as whether a mobile application runs seamlessly on mobile devices such as smartphones (in other words applications are compatible with and integrated smoothly into smartphones), whether mobile applications are always available and have the ability to respond to user requests in a timely fashion and whether mobile applications can deliver its utilities in a reliable manner.	Application Plan: - application architecture; - hardware and software Infrastructure Architecture: - network infrastructure
xxvi.	**Mobile customer loyalty applications**, which are linked to the point-of-sale terminals in store, can assist companies in gathering relevant information about customer behaviour. Mobile applications can be used for this purpose, which will assist the company with	Application Plan: - application architecture

	Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:	**The component of IT architecture which will be affected (refer to section 3.6):**
	improved customer interaction. These applications can be used for targeted advertising, notifying customers of specials on products or new products which the customer might be interested in, based on past behaviour. According to Stathopoulou and Balabanis (2016:5802) properly designed loyalty programs which are used effectively can contribute to creating closer customer relationships over the long-term.	
xxvii.	**Big data** is defined by Gartner (n.d.) as " high-volume, high-velocity and/or high-variety information assets". Big data requires information processing in order to enable process automation and provide insight to the vast amount of data in order to improve decision making (Gartner, n.d.). **Analytics,** should be used to obtain insight into big data by identifying trends and attaining insight into the vast amounts of data available. Cognitive analytics represent the ability of computers to learn from experience, break down and analyse large volumes of complex data to identify patterns in and links between the data and come to conclusions based on the analysis of information (Briggs, 2014:19). Data warehousing and data analysis tools should be utilised to provide the company with the ability to collect data about its customers, products and markets from various sources, store and analyse this data in a meaningful way, with the purpose of using the processed information to enable improved decision making about *inter alia* product and service development and customer satisfaction. In addition, the use of analytics has assisted companies in improving employee skills and knowledge (Briggs *et al.*, 2016:97). According to Briggs (2014:19) "cognitive analytics can be a powerful way to bridge the gap between the intent of big data and the reality of practical decision making". Cognitive analytics should be used to assist humans to understand specific business issues, based on a large volume of data obtained from different sources, available in various formats, and make decisions accordingly (Briggs, 2014:22 & 27).	<u>Application Plan:</u> - Hardware and software; - data and information <u>Infrastructure Architecture:</u> - processing of information; - network infrastructure; - integration
xxviii.	According to Boshoff (2014) **power user tools** need to be used to share and access information. Webopedia	<u>Application Plan:</u>

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:		**The component of IT architecture which will be affected (refer to section 3.6):**
	(n.d.) defines a power user as someone with considerable experience with, and sufficient knowledge of, computers and therefore have the ability to utilise advanced features of applications. Power user tools refer to computer systems and applications which can be used by these sophisticated users of computers (power users) and are very efficient if used properly.	- application architecture
xxix.	According a study done by EY (n.d.) the advancements in technology have given companies the opportunity to form teams based on knowledge and skills and are no longer restricted by the location of team members. A survey conducted by EY (n.d.) indicated that the extent to which **teams are using technology** as opposed to face-to-face meetings has increased considerably since 2010.	Infrastructure Architecture: - network infrastructure
xxx.	**Cloud computing** refers to the use of various internet-based services, including Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) and offers scalability and flexibility to companies who chooses to make use of this style of computing (Gartner, n.d.; Techopedia, n.d.). Cloud computing is a very powerful tool for companies to increase their processing power, storage and business processes, which makes it especially popular amongst smaller companies (Techopedia, n.d.).	Application Plan: - hardware and software; - data and information Infrastructure Architecture: - processing of information; - network infrastructure
xxxi.	**Internet of Things (IoT)** refers to a "network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment" (Gartner, n.d.). According to Briggs *et al.* (2016:36) the value of the IoT is that it produces valuable information which can be used in powerful combination with analytics discussed in xxvii. IoT can assist companies in understanding their production processes, customers and markets more clearly and can lead to improved automation of business processes (Briggs *et al.*, 2016).	Application Plan: - hardware and software; - office automation; - data and information Infrastructure Architecture: - processing of information; - network infrastructure

Possible areas of IT architecture and specific enabling technologies which could assist companies in achieving its business imperatives:	**The component of IT architecture which will be affected (refer to section 3.6):**
xxxii. **Information security vulnerabilities need to be minimised** by protecting access to information by means of physical and logical access controls, protecting information from malware, managing network and connectivity security, managing endpoint security (such as output or storage devices) and monitoring the IT infrastructure for security-related incidents (ISACA, n.d.).	<u>Application Plan:</u> - application architecture; - hardware and software; - data and information <u>Infrastructure Architecture:</u> - processing of information; - network infrastructure